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Work Plan

for the . . .

Remedial Investigation and Feasibility Study

of the . . .

Skinner Landfill Site
West Chester, Ohio

prepared for . . .

U.S. Environmental Protection Agency
Region V
Chicago, Illinois

EPA Contract No. 68-W8-0079
EPA Work Assignment No. 04-5L73
WW Engineering & Science Project No. 04003
July, 1989

EDI Engineering & Science
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TABLE OF CONTENTS

FIGURES

TABLES

APPENDIX

SECTION 1

INTRODUCTION

1.1 BACKGROUND

In December 1982, the United States Environmental Protection Agency (U.S. EPA) placed the Skinner Landfill site on the National Priority list (NPL) in group 14 with a ranking of 659. Phase I Remedial Investigation (RI) activities were initiated under REM II in 1984 by Roy F. Weston, Inc. Their Phase I field activities resulted in the issuance of a Preliminary Phase I Remedial Investigation/Feasibility Study (RI/FS) report in December of 1988. WESTON never fully implemented Phase II RI activities. Consequently additional RI activities are necessary to develop a feasibility study.

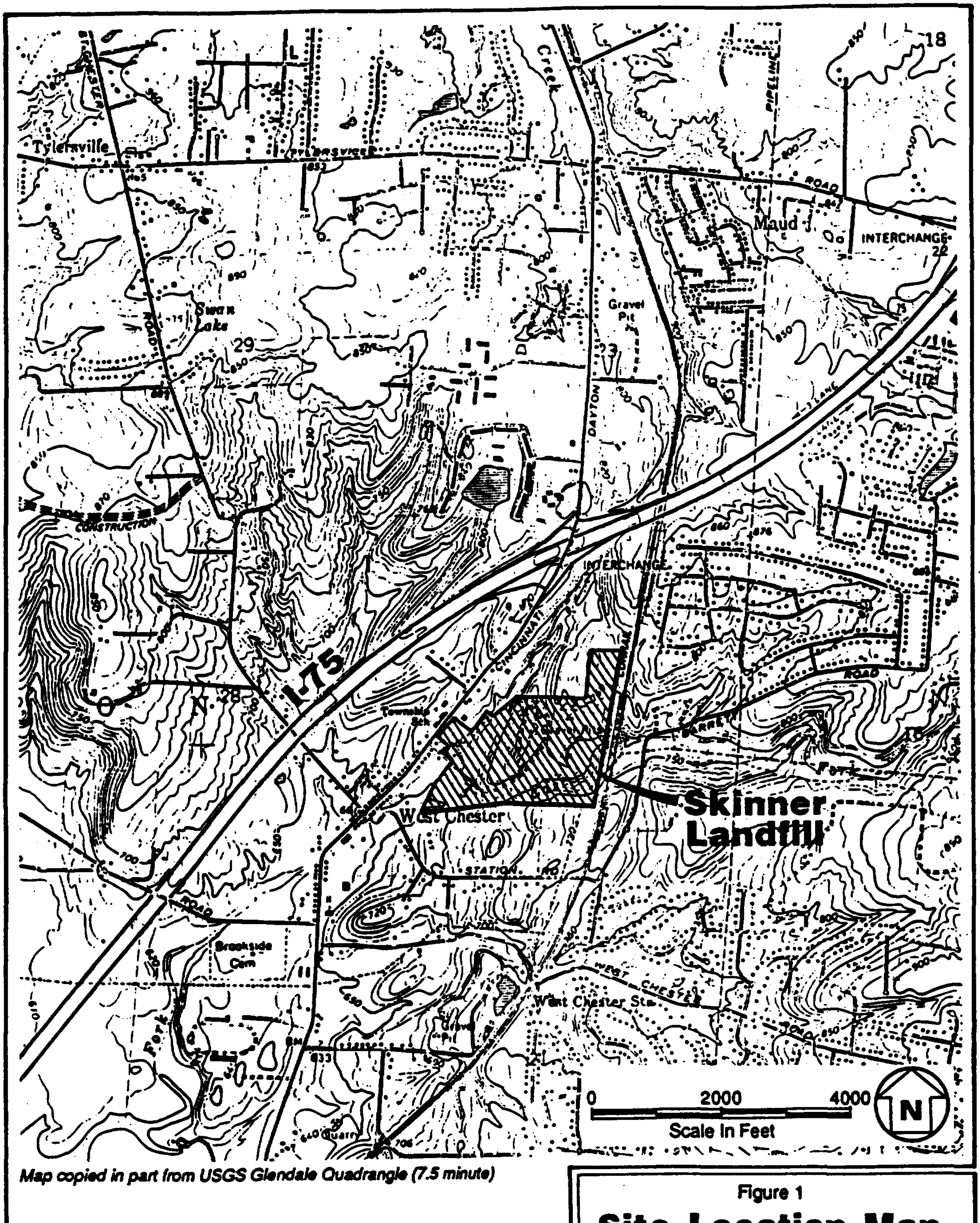
RI/FS work at the Skinner Landfill site has subsequently been transferred to WW Engineering and Science, Inc. (WWES) under an Alternative Remedial Contracting Strategy (ARCS) contract. The Phase II RI/FS of the Skinner Landfill site was authorized under U.S.EPA Work Assignment 04-5L73, executed on January 4, 1989, between the U.S. EPA and WWES.

This Work Plan describes the scope of work and proposed methods necessary to complete the Phase II RI/FS of the Skinner site. WWES will perform the proposed work for the U.S.EPA under EPA Contract No. 68-W-0079. The Phase II RI/FS will be conducted under the authority of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), and the Superfund Amendments and Reauthorization Act of 1986 (SARA).

The objectives of the Phase II RI/FS are to confirm and further evaluate the nature and extent of contamination on the Skinner Landfill site, to determine the presence of contaminants on off-site areas and to develop the best remediation alternative(s) that is protective of human health and the environment.

1.1.1 Site Location and Site Definition

The Skinner Landfill is an active landfill which is currently approved to accept only demolition debris. The landfill is located approximately 15 miles north of Cincinnati, Ohio, in Section 22 (T3N, R2W) of Butler County (see Figure 1). The landfill is located approximately one-half mile south of the intersection of Interstate 75 and the Cincinnati Dayton Road, and one-half mile north of the town of West Chester.



Map copied in part from USGS Glendale Quadrangle (7.5 minute)

Figure 1

Site Location Map

Skinner Landfill

West Chester, Ohio

February, 1989

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The Skinner property is comprised of approximately 78 acres of hilly terrain, bordered on the immediate south by the East Fork of Mill Creek. The landfill is bordered to the north by wooded land, to the east by a Consolidated Rail Corporation (Conrail) right-of-way, to the south across the East Fork of Mill Creek by agricultural and wooded land and to the west by the Cincinnati-Dayton Road. The principal residential area is west of the landfill; however, numerous residences are located within 2,000 feet of the landfill to the east, south, and west (see Figure 2).

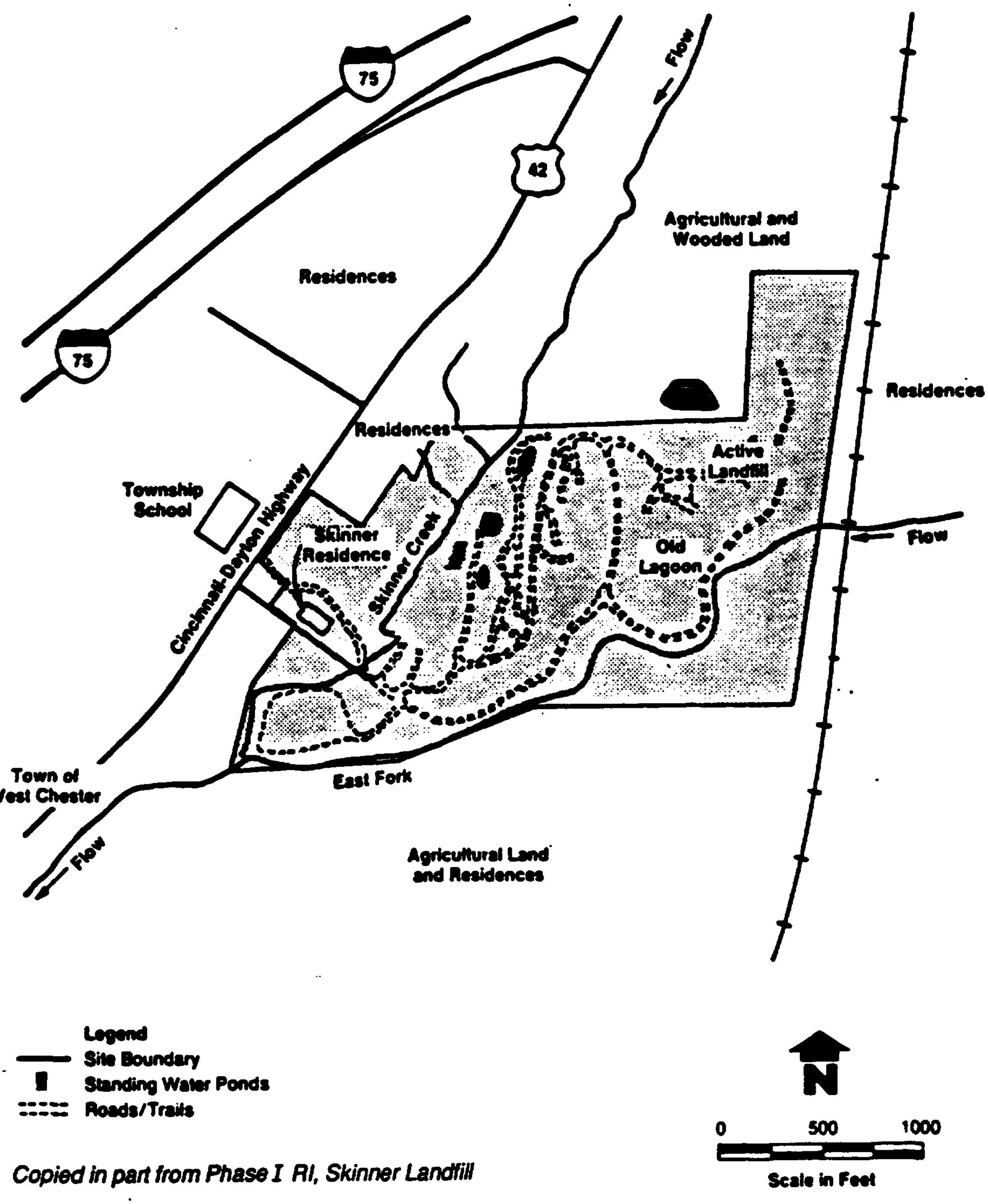
The area under investigation consists of property owned by Elsa Skinner (Mrs. Albert Skinner) and Ray Skinner, which includes the Skinner landfill and adjacent areas. The predominant areas of investigation outside the landfill will consist of residential wells near the landfill. Sample points will be established in areas north and south of the landfill for collecting surface water, ground water, and soil samples to characterize background levels and to help determine the risk to human health and the environment.

1.1.2 History and Site Chronology

The Skinner property, which was originally a sand and gravel operation, first became involved in landfill operations in 1934, with the disposal of general municipal refuse in abandoned sand and gravel pits. It is unknown exactly what materials were deposited in the landfill from 1934 to the present. From the records available the following is known about the site chronology. In 1959, the landfill was used for the disposal of scrap metal and general trash from a paper manufacturing plant. In the spring of 1963, the Butler County Board of Health (BCBH) approved the use of the site as a sanitary landfill. In 1963, during the permitting procedure, local residents opposed the landfill stating that chemical wastes were being dumped there.

In April of 1976, numerous citizen complaints and observations of a black, oily liquid in a waste lagoon by a fireman fighting a fire at the Skinner Landfill prompted the Ohio Environmental Protection Agency (OEPA) to investigate the Skinner Landfill. After being denied access on April 22, 1976, representatives of BCBH, OEPA, the Southwestern Ohio Air Pollution Control (SOAPC) and the Butler County Sheriff's Department (BCSD) entered the Skinner Landfill with a search warrant on April 26, 1976. The area of the waste lagoon showed evidence of recent regrading and over one hundred 55 gallon drums marked "Chemical Waste" were observed.

Inspection, by the OEPA, of aerial photos taken in early April 1976 revealed a lagoon in the area that had recently been regraded. The aerial photo also revealed several hundred



Copied in part from Phase I RI, Skinner Landfill

Figure 2

SITE MAP

Skinner Landfill

West Chester, Ohio

February, 1989

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drums scattered throughout the site. The OEPA returned to the Skinner Landfill with a search warrant on May 4, 1976. The road leading to the lagoon was blocked by a bulldozer that Mr. Albert Skinner claimed was inoperable. When told that the OEPA would return with equipment to remove the bulldozer, Mr. Albert Skinner claimed the following materials were buried at the landfill: nerve gas, mustard gas, incendiary bombs, phosphorous, flame throwers, cyanide ash, and explosive devices. At this time the OEPA withdrew from the site.

On May 11, 1976, representatives of the OEPA, the Army Special Unit, and the BCSD, entered the landfill and proceeded to the buried lagoon area. Samples collected from a trench excavated at the site of the lagoon detected the presence of pesticides, including chlordane intermediates, some volatile organic compounds, and elevated concentrations of several heavy metals.

From July 1976 to July 1977, the Skinners retained H. C. Nutting Company to conduct a shallow geologic investigation. From this investigation there are records of five borings drilled 9 to 16.5 feet deep in the area of the lagoon. The logs show mixed soils of sand, silt, clay and gravel with occasional mention of "organics" and "odor detected." Copies of these borings are provided in Appendix A.

The OEPA made a subsequent site inspection in July 1977. WESTON's Phase I Work Plan states that the OEPA found leachate seeping from near the buried lagoon and a faint chemical odor near the buried lagoon. From August 1977 to January 1979, OEPA attempted to get a court ruling to order Skinner to remove chemical waste from his site. The court did, however, prohibit Skinner from disposing of industrial waste in the future, except under legal permit. Subsequent appeals by OEPA were also unsuccessful.

In July 1982, the Field Investigation Team (FIT) installed four monitoring wells in the buried lagoon area to characterize the site (CH2M Hill, 1983). Appendix A also contains the boring logs from the FIT wells. Volatile organic compounds were detected in samples collected from a monitoring well located southeast of the buried lagoon. As a result of [illegible] investigation, the Skinner Landfill was placed on the NPL in 1982 with a ranking of 659. This action prompted the initiation of a RI/FS. Phase I RI activities were initiated by Roy F. Weston in September 1984.

In the Spring of 1986, WESTON initiated a field investigation for Phase I of the RI. The initial field investigation included the following: a geophysical survey, installation of eighteen monitoring wells, and sampling of ground water, surface water, sediment and soils. A biological survey of fish and macroinvertebrate fauna collected from the East Fork of Mill Creek and Skinner Creek was also performed to assess the diversity of biota present in the creeks.

An additional round of media sampling was performed July of 1987 on ground water, surface water, sediment, and soil in accordance with the recommendations outlined in the Phase I Interim RI Report. A soil gas survey was also performed in the vicinity of the buried lagoon in an attempt to define specific areas needing further exploration (such as excavation of test pits).

The results of the Phase I RI are contained in a Phase I Interim Remedial Investigation Report prepared by Roy F. Weston. No field sampling activities have occurred at the site since July 1987. The site is visited monthly by members of the TAT team from Cincinnati, Ohio to note significant changes in site conditions.

Presently, the Skinner Landfill is authorized to accept demolition debris only. Visual inspection of the debris in January, 1989 by WWES personnel indicated that solid waste material (paper, plastic trash bags, cardboard, and metal drums, appliances, and plastic household debris) other than demolition debris was being accepted at the landfill.

1.1.3 Environmental Setting

1.1.3.1 Physiography

The physiography of the Skinner Landfill can be characterized as two parallel hills oriented in a north-south direction bordered on the west and south by small creeks and on the northwest by uplands. Elevations range from approximately 645 feet above mean sea level (MSL) in the southwest to 794 feet (MSL) in the north. A prominent physiographic feature of the area is the East Fork of Mill Creek which flows southwesterly and forms the southern boundary of the site.

1.1.3.2 Soils

The soils beneath the site were described in WESTON's Phase I Interim RI report as follows:

> "In general, the site is underlain by relatively thin glacial drift (less than 35 feet) over interbedded shales and limestones of Ordovician age. Based on water well logs and boring logs from the limited on-site investigations performed prior to the RI (Field Investigation Team HRS Package, 1982; H. C. Nutting Report, 1977), the soils are mixtures of sand, silt and clay in

varying proportions. The soil stratigraphy was not well defined. Boring logs indicate that bedrock is about 15 feet below the surface on the west side of the old lagoon and drops off sharply eastward."

"The surficial soils at the site consist primarily of brown clay to silty sandy clay. Although much of the Skinner site has been subject to quarrying and landfilling, the natural soils remaining on site consist of the Russell silt loam, the Wynn silt loam, the Eden clay loam, and the Genessee loam (USDA Soil Conservation Service, 1976, Soil Survey of Butler County, Ohio). These soils have compositions ranging from loam and silt loam to silty clay and clay in the upper 18 inches of the soil profile, which corresponds to the maximum soil sample depth of 18 inches."

"The subsurface geologic units, determined by split spoon sampling and rock coring during drilling, are characterized by interbedded shale and limestone bedrock overlain by intermixed silt, sand and gravel, and silty, sandy clays of glacial origin. The sand and gravel deposits comprise the hills and ridges and are usually encountered near the surface in the central portion of the site. The silts and clays; when present, usually occur as lenses in the sands and gravels or directly overlie bedrock. Clays occur at the surface in the far northeastern portion of the site and at the banks of East Fork Mill Creek and Skinner Creek."

1.1.3.3 Surface Water

Two small creeks and a series of ponds (see Figure 2) are the predominant surface water features at the site. The East Fork of Mill Creek is a rapidly flowing stream with an average gradient of 0.01 ft/ft and an estimated average flow of 10 cubic feet per second. The East Fork of Mill Creek flows on bedrock at various locations south of the Skinner site. Observations made during the January 1989 site visit indicate that this is a very flashy creek, capable of scouring sediments during flooding. This is significant because contaminants could be contained in the sediments that are carried downstream during flood events. Skinner Creek has an average gradient of 0.02 ft/ft and an estimated average flow of 2 cubic feet per second.

A series of four small ponds are located in a line roughly 75 feet east of Skinner Creek (see Figure 2). Prior to 1968, these ponds were not evident on the aerial photographs. They appear to be a result of quarrying for the sand and gravel and rock crushing operations. The two southern ponds are less than 1000 square feet in area. The two northern ponds are larger and appear deeper than the southern ponds. The roads, where not blocked by metal debris, provide easy access to the larger ponds.

A large shallow pond north of the active landfill (see Figure 2) appears to be a result of landfill operations damming natural surface drainage. Although the pond is relatively large, the local topography is flat, and plants appear throughout the pond indicating it is shallow.

1.1.3.4 Geology

The Skinner Landfill lies near the middle of the Cincinnati Arch. This is a regional geologic structure in the sedimentary bedrock. From the middle of the arch, Paleozoic age rock dip gently to the east and west. At the site the bedrock has a dip of 1 foot per mile to the west (Thelen, 1980) and consists of Ordovician age interbedded shales and limestones. A bedrock high (650 MSL) was mapped by WESTON in the northeastern section of the Skinner Landfill. According to Hosler (1976) a buried bedrock valley underlies Skinner Creek in the southwest section of Skinner property. A seismic survey conducted by WESTON, estimated the depth to bedrock to be 32 to 49 feet in this area; however, this has not been substantiated with borings.

A subsurface survey (Thelen, 1980) was conducted for the installation of a sanitary sewer in the East Fork of Mill Creek in 1980. Seven soil borings were completed in or adjacent to Skinner property. The average depth to bedrock was 11.8 feet with a range of 7.4 to 24 feet. They found the bedrock consisted of shale and thinly bedded limestones, that are weathered at the surface. The thinly bedded limestones range in thickness from less than 1 inch to greater than 12 inches. The limestone layers are not necessarily continuous and may pinch in and out. The limestone layers are fractured in a random pattern and ground water seepage may occur along bedding planes.

Glacial landforms at the site are not distinct. The Skinner Landfill lies near the southern edge of Wisconsin glaciation, and the varied distribution of clays, sands and gravels [illegible].

The [illegible] topography and is generally located 20 to 30 feet below the ground [illegible] Based on boring logs, water level measurements, and field observations, WESTON divided the unconfined aquifer into the following geologic units: an unconsolidated outwash sand and gravel unit and a fractured bedrock unit. No other aquifers were identified in the WESTON Phase I Interim RI Report. Although the layered limestone layers are probably not thick enough to provide substantial amounts of water, they may provide a pathway for contaminants to migrate off site.

Based on ground water levels obtained by WESTON in July 1987, two ground water divides are located near the middle of the parallel hills, as shown in Figure 3. Ground water flows away from the divides and appears to discharge into both Skinner Creek and the East Fork of Mill Creek. The fractured nature of the bedrock probably allows for ground water flow in the bedrock as evidenced by downward gradients in well pairs GW09,-GW10 and GW17-GW18. There is also a possibility that ground water flow in fractures and along bedding planes in the bedrock may extend beneath the East Fork of Mill Creek or in other directions away from the site.

Because contaminants were detected in bedrock wells during the Phase I RI, the flow in the shallow bedrock will be evaluated during Phase II of the RI. This evaluation is an integral part of identifying the pathway of contaminants leaving the site.

1.1.4 Pre-Phase I Data

The Skinner Landfill site became more active as a waste disposal site in the early 1960's with the approval to operate as a sanitary landfill by the BCBH. Aerial photos taken in 1976 indicate that a lagoon, several ponds, and piles of drums were present on the site.

In 1976, trenches dug by the OEPA in the area of the buried lagoon revealed the presence of hazardous material in sludge samples. Subsequent investigations by the FIT and the TAT also indicate hazardous constituents exist in the ground water, drums and soils at the Skinner Landfill site.

In 1963, citizens opposed the operation of the Skinner Landfill as a sanitary landfill, claiming that chemical wastes were being disposed of at the Skinner Landfill. WESTON's Work Plan (1985) reported that in May, 1976 in response to statements that military ordnance was disposed at the landfill, an official of the Hamilton County Health Department and a former public official of Reading, Ohio, "*confirmed only that cyanide ash, phosphorus, and one or two flame throwers with canisters had been disposed of by the Skinners*."

Analyses of sludge from the buried lagoon and drum liquids sampled in May of 1976 by the OEPA detected the presence of pesticides, including chlordane intermediates, some volatile organic compounds, and heavy metals (see Table 1).

Results of ground water samples collected in July of 1982 by the FIT are listed in Table 2. Although four wells were installed, only the two wells south of the buried lagoon were sampled, the other two wells were reported to be dry. The monitoring well located southeast of the buried lagoon (B-6) detected the presence of seventeen volatile and

TABLE 1

HAZARDOUS CHEMICALS DETECTED IN A TRENCH
SKINNER LANDFILL, MAY 1976

Organic Compounds*

Major Constituents

Octachlorocyclopentene
Naphthalene
Heptachlornorborene
Hexachlorobenzene
Chlordane

Minor Constituents

Hexachlorocyclopentadiene
Methyl Naphthalene
Isobutyl Benzoate
Hexachloronorbornadiene
Trichloropropane
Dichlorobenzene
1,3 Hexachlorobutadiene
Octachlor penta fulvalene
Methyl Benzylphenone
Benzoic acid

Inorganic Compounds (maximum concentrations, ppm)

Phenols (27.3)
Cyanide (761)
Cadmium (755)
Chromium (350)
Lead (1370)
Zinc (480)
Copper (1840)
Mercury (0.075)

* Qualitative determination by GC/MS. Original Report contained in Appendix A.

TABLE 2

HAZARDOUS CHEMICALS DETECTED IN MONITORING WELLS
SKINNER LANDFILL, JULY 1982

	Well B-6*	Well B-5*
Bis-(2-chloroisopropyl)ether	350 ppb	ND
Benzene	79 ppb	ND
1,2-Dichloroethane	163 ppb	ND
1,1,1-Trichloroethane	13 ppb	ND
1,1-Dichloroethane	131 ppb	ND
1,1,2-Trichloroethane	<10 ppb	ND
Chloroethane	35 ppb	ND
Chloroform	17 ppb	ND
Trans-1,2-Dichloroethylene	60 ppb	ND
1,2-Dichloropropane	283 ppb	<10 ppb
Ethyl benzene	<10 ppb	ND
Methylene Chloride	17 ppb	ND
Toluene	450 ppb	ND
Trichloroethylene	<10 ppb	ND
Vinyl Chloride	24 ppb	ND
Naphthalene	<10 ppb	ND
Diethyl Phthalate	<10 ppb	ND

*Well B-6 is located SE of the buried lagoon, Well B-5 is located SW of the buried lagoon.

ND - Not Detected

semi-volatile organic compounds which are presented in Table 2. The FIT monitoring well located southwest of the buried lagoon (B-5) detected the presence of only one of the seventeen compounds present in B-6. This suggests that the bulk of the ground water is moving away from the buried lagoon in a south easterly direction.

In February and March of 1986, in response to a request from the U.S.EPA Remedial Project Manager, the U.S. EPA Emergency Response Section requested Weston's TAT to perform a site assessment of the Skinner Landfill. This report is contained in its entirety in Appendix B. A sampling location map was not included with this report. Analysis of media termed "lagoon seep, lagoon runoff, dump seep and dump runoff" detected the presence of volatile and semi-volatile organics.

A sample collected from a drum located on the north boundary of the landfill contained 15 ppb benzene and 3800 ppb toluene. A flash point of 82^{o}F was measured from the sample collected from the drum.

Soil collected adjacent to Skinner Creek contained 3580 ppb 2-chloroethyl vinyl ether, 294 ppb chloroform, and 11 ppb ethyl benzene.

Five ground water samples were also collected from wells located on the Skinner Landfill property. The ground water analyses detected the presence of volatile organics, semi-volatile organics and elevated concentrations of arsenic and zinc. The most notable compounds detected in the ground water were benzene (1270 ppb) 1-1-dichloroethane (1960 ppb), 1-,2-dichloropropane (1376 ppb), methylene chloride (1104 ppb) and toluene (3393 ppb). This information can only be used qualitatively, however, because the sampling locations were not documented.

1.1.5 Summary of Phase I RI

WESTON began a comprehensive geological investigation of the Skinner Landfill as Phase I of the RI. Chemical data collected from the site prior to the Phase II Investigation is contained in Appendix B and is described in this brief summary. The major portion of WESTON's field activities for Phase I of the Remedial Investigation was performed in the spring of 1986, . The field activities consisted of a geophysical investigations using several instruments, the installation of monitoring wells, the collection of ground water, surface water, sediment, and soil samples for chemical analysis, and a biological survey of Skinner Creek and the East Fork of Mill Creek. A second round of ground water sampling was performed in the fall of 1986. A third round of media sampling (ground water, surface water, sediment and soil) was performed in July 1987. The results of the third round of sampling were not incorporated into the Phase I Interim RI Report but are contained in Appendix B. The following sections summarize the data.

1.1.5.1 Geophysical Surveys

Ten seismic refraction lines were run in the Spring of 1986 to determine the depth to bedrock. WESTON's interpretation of the data showed that depth to bedrock varied from 11 to 80 feet, and that in general, the bedrock topography mirrors the surface topography.

Electromagnetic surveys were conducted by WESTON (using a Geonics EM-34 terrain conductivity meter) near the buried lagoon, northwest of the buried lagoon, and adjacent to the East Fork of Mill Creek. Due to abundant surface metal, the data from northwest of the buried lagoon was inconclusive and, therefore, not incorporated into the Phase I RI Report. Several "hot spots" were detected at the buried lagoon. The conductivity values were consistent with conductivities measured when buried metal is present. The results of the EM survey adjacent to the East Fork of Mill Creek did not detect the presence of buried metal. There were elevated conductivities noted in several locations that may be attributed to leachate migration or may reflect natural conductivity changes as a function of changes in soil type.

Ground penetrating radar (GPR) was used northwest of the buried lagoon and in the buried lagoon area. Eight potential drum nests were identified in the lagoon area; and one possible drum nest northwest of the buried lagoon. In addition many drum-like signatures or buried objects were reported in the lagoon area; and ten drum-like signatures or buried objects were detected in the area northwest of the buried lagoon.

A magnetometer survey was conducted to supplement the GPR in the vicinity of the lagoon and northwest of the lagoon. Contours of the magnetic gradient indicate two anomalies exist. The magnetometer data appears to generally outline the buried lagoon.

1.1.5.2 Monitoring Wells

In May of 1986, 18 monitoring wells were installed at the Skinner Landfill. Three deep wells were screened at or near the bedrock. The remaining wells were shallow, and the well screens were placed to straddle the water table. Two of the wells (GW13 and GW08) were reportedly dry in August 1986 and July 1987.

Storm runoff appears to flow from the higher elevations into ravines or creeks which discharge into the East Fork of Mill Creek, as shown in Figure 3. Ground water flow in the vicinity of the buried lagoon is to the southeast towards the East Fork of Mill Creek.

Water levels collected from shallow wells screened in the unconsolidated glacial drift and adjacent deep wells screened in the consolidated shale and limestone deposits indicate the vertical gradient is downward into the bedrock. Two of the deep wells are contaminated. It is not known whether the ground water flow patterns in the bedrock are the same as in the shallower unconsolidated soils. It is possible that the bordering stream may not be the discharge zone for deeper ground water within the bedrock.

Ground water samples were collected and analyzed in the spring and summer of 1986 and in the summer of 1987. Samples were analyzed for VOCs, semi-volatile organics, inorganics, pesticides, and PCB's. Tables summarizing Rounds 1, 2 and 3 of the RI/FS sampling results are contained in Appendix B.

Ground water downgradient from the buried lagoon and beneath the active landfill has been impacted by volatile, semi-volatile, and inorganic compounds. Acetone, toluene, and benzene were consistently detected in wells GW20 and GW22. Benzene was detected at 20 ppm in GW22 and acetone at 5.9 ppm in GW20. GW22 also had high levels of total xylenes and 1,2-dichloroethane. These wells are screened in the unconsolidated glacial drift.

The following compounds were detected in ground water above the Maximum Contaminant Levels (MCL's): benzene, carbon tetrachloride, tetrachloroethene, vinyl chloride, 1,4-dichlorobenzene, and barium.

Pentachlorophenol was detected in ground water above the MCL goal. Iron and manganese were present above secondary MCL's in the ground water samples collected. Concentrations of aluminum exceeded established secondary MCL goals. Secondary MCL's are established to protect the aesthetic qualities of drinking water.

Although the majority of the contamination existed in the shallow wells, benzene, tetrachloroethene, pentachlorophenol and trans-1,2 dichloroethene were found in the bedrock wells. It appears that the denser contaminants are moving into the bedrock.

Low levels of pesticides were detected in round 2 samples only. No PCB's were detected in ground water samples.

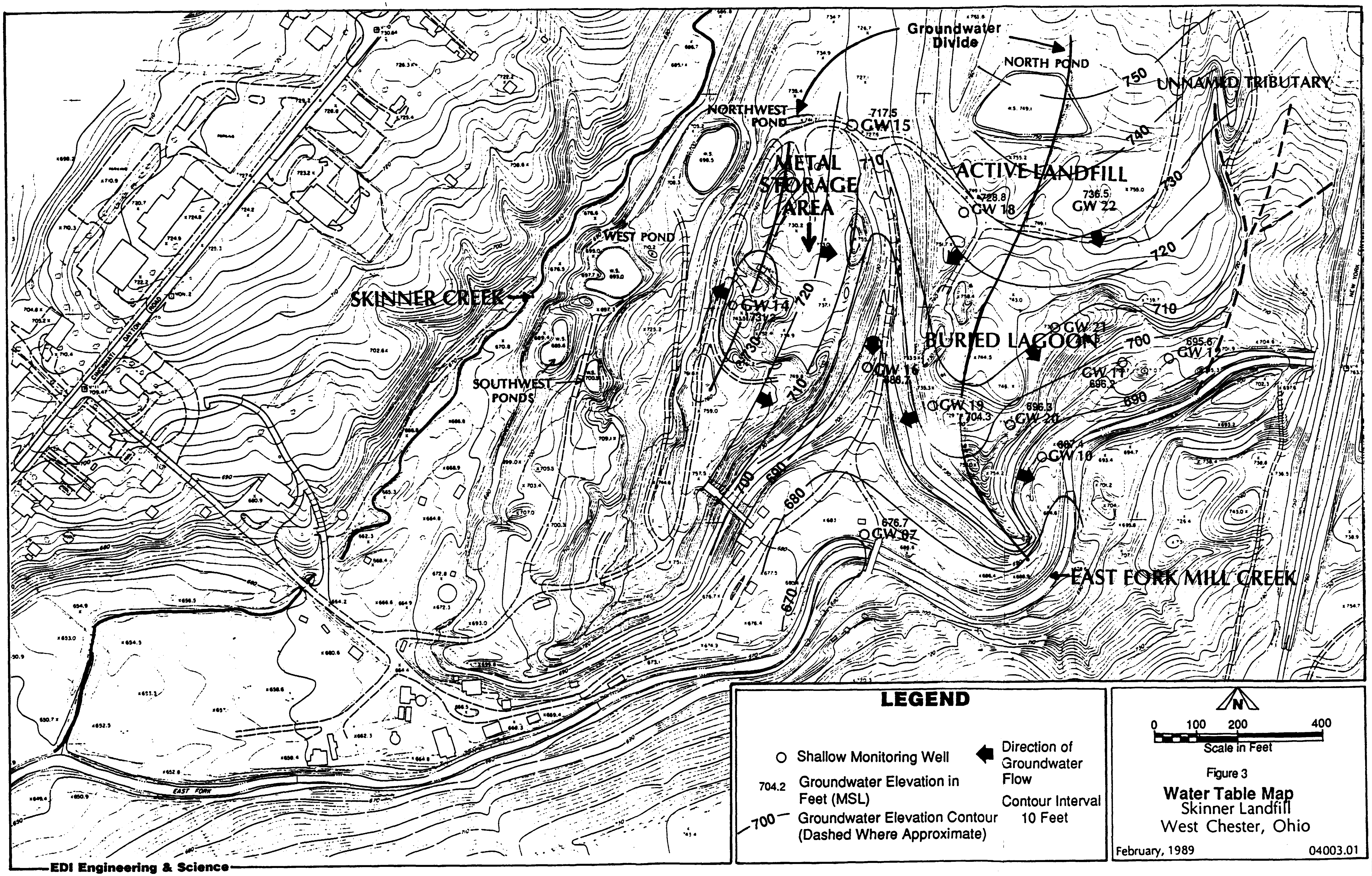


Figure 3
Water Table Map
Skinner Landfill
West Chester, Ohio

February, 1989 04003.01

Additional ground water and surface water data are needed to characterize the extent of contamination and to adequately assess the potential risk to human health and the environment. Specific areas lacking data are the area along Skinner Creek, background data for bedrock wells, the area across the East Fork of Mill Creek which is downgradient from the buried lagoon, and the ponds on the site.

1.1.5.3 Residential Wells

Of the seven residential wells sampled by WESTON in August 1986, two of the wells were not operational (RW06 and RW10) but contained standing water. VOCs were detected in two residential wells (RW 03 & RW 10); however the validity of these results is suspect because similar low levels of acetone and 1,1,1-trichloroethene were also detected in the field blanks. Chloroform and bromodichloromethane were present in RW03 below the MCL. Chloroform is a compound found in solvents, refrigerants, insecticides, and fire extinguishers. Bromodichloromethane is a fluid ingredient of fire extinguishers. These types of trihalomethanes are commonly found by-products in residential wells resulting from chlorination of the well during construction.

Semi-volatile organic compounds were detected at low levels in RW02 and RW10. No drinking water standards exist for the particular compounds detected. Pesticides were detected in all wells except RW01. The proposed MCL's was exceeded for the following compounds: heptachlor, heptachlor epoxide, and PCB Aroclor 1254.

Elevated levels of iron, aluminum, zinc, manganese and calcium were detected in the non-operational wells. Several of the operating wells also had elevated levels of iron and manganese. Secondary MCL's were exceeded for chloride, iron and manganese.

WESTON did not sample any residential wells on site and did not provide well construction details for residential wells off site; therefore, additional residential wells need to be sampled to assess the potential for contamination in the drinking water supply.

1.1.5.4 Surface Water and Sediment

Surface water and sediment samples were collected in May of 1986 and July of 1987. During the two rounds of sampling, surface water samples were collected from 16 locations and sediment samples were collected from 17 locations (see Appendix B).

Surface water and sediment samples collected from the East Fork of Mill Creek and Skinner Creek detected low levels of 2-butanone, acetone and methylene chloride. The validity of these results is suspect, however, because similar low levels were also detected in the associated laboratory blanks.

Surface water and sediment samples collected from the ponds and the unnamed tributary had similar validity problems with 2-butanone, acetone, and methylene chloride. In addition, two sediment samples collected from the western ponds contained elevated levels of 1,1-dichloroethane, benzene, ethylbenzene, and total xylenes.

Semi-volatile organic compounds in the surface water collected on-site did not appear to be a cause for concern. Many semi-volatile organic compounds were detected in the sediment samples. A complete list is contained in Appendix B.

No pesticide/PCB compounds were detected at any surface water sampling locations. Pesticide/PCB compounds were detected in sediment samples collected from Skinner Creek, the western ponds, and from a leachate sample collected adjacent to the active landfill. Most notable was a sediment sample collected from the most northern pond adjacent to Skinner Creek that contained 442 ppb, Arocolor-1260.

Elevated concentrations of aluminum and iron were detected in most of the surface water and sediment samples collected. Barium was present in leachate samples at elevated concentrations and also from the most downstream sampling location. Elevated concentrations of manganese and zinc were also present in most of the sediment samples collected.

Additional surface water and sediment sampling is warranted for the following reasons;

- Reliability of Phase I volatile organic data is suspect due to the presence of similar compounds in laboratory and field blanks.

- Limited amount of background data for purposes of comparison.

- Verification and further exploration of the western ponds is warranted because of the presence of volatile organics, semi-volatile organics and PCB's.

- Further definition of potential downstream contamination is warranted because of the presence of elevated concentrations of semi-volatile organics in the sediment and elevated concentrations of inorganic compounds in the surface water and sediment at the most downstream Phase I sampling location.

1.1.5.5 Surface Soils

Soil samples were collected in the spring of 1986 and in July of 1987. Soil samples were collected at 15 locations during the two rounds of sampling. Appendix B contains the results of the soil sampling.

Relatively high concentrations of semi-volatile organic compounds were found in surface soil samples SS03 and SS05, which are located adjacent to junk storage tanks. The PCB Aroclor-1254 was detected at 980 ppb at a depth of 18 inches at the sample location SS07. Sample location SS07 also contained elevated levels of cadmium, copper, lead, and mercury. Cyanide was detected at locations SS07 and SS08 at concentrations of 1.6 mg/kg and 1.8 mg/kg, respectively.

Subsurface soil samples were not collected during the installation of monitoring wells in Phase I RI activities. To quantify the volume of contaminated soil that may need to be treated, soil boring samples will be collected and analyzed during Phase II. A more detailed discussion concerning the rationale for additional soil sampling is included in Section 2.4.5.

1.1.5.6 Soil Gas Survey

A soil gas survey was conducted by WESTON at the Skinner site in April, 1987, using a Miran 1B Portable Ambient Air Analyzer. The results of the soil gas survey are contained in Appendix B. Nineteen soil probes were placed within a rectangular grid that covered the approximate area of the buried lagoon. Probes were placed in locations that coincided with areas of possible contamination as identified with GPR and EM surveys. Soil gas analyses were conducted for benzene, toluene, and methylene chloride.

Concentrations of benzene contained in the soil gas ranged from 1.2 to 50 ppm, toluene from 1.7 to 768 ppm, and methylene chloride from 2.2 to 868 ppm. There did not appear to be any obvious trend to the data; however, areas of higher concentrations were reported from the northwest and western portions of the grid in the area of the buried lagoon.

1.1.6 Data Gaps

The following site characteristics need to be further investigated before performing an assessment on the affect of known contaminants and identifying remedial alternatives.

- The pathway of contamination migration into the shallow bedrock units underlying the site.
- The extent of shallow bedrock contamination.
- Background values for surface water and sediments
- Ground water elevation data for the western portion of the site
- The estimated extent and rate of migration of contamination off-site
- The hydrogeologic relationships between the surface water, ground water in the unconsolidated portion of the aquifer, and the ground water in the shallow bedrock portion of the aquifer.
- The lateral extent of contamination (if any) to residential wells in the immediate area.
- The volume of waste in the buried lagoon.

SECTION 2
REMEDIAL INVESTIGATION OF THE SKINNER LANDFILL SITE - PHASE II

2.1 PURPOSE

The purpose of the Phase II RI is to acquire enough additional data to better characterize the contamination and the hydrogeology of the site so that sufficient remedial alternatives may be developed and evaluated during the Feasibility Study. This information will be used to evaluate the potential risk to the environment and public health. The data will be collected to support the Feasibility Study and an ATSDR (Agency of Toxic Substances and Disease Registry) health assessment. All data gathered will be obtained in accordance with the Quality Assurance Project Plan (QAPP) Addendum and the Sampling Plan.

2.2 SCOPE

The scope of the work has been designed to accomplish the following:

1. Further characterize the site and quantify the risk to human health and the environment.
2. Better determine the shallow bedrock hydrogeology.
3. Estimate the extent and rate of movement of off-site contamination.
4. Further characterize background values.
5. Evaluate the hydrogeological relationships between surface water, and ground water in the unconsolidated portion of the aquifer and ground water in the shallow bedrock portion of the aquifer.
6. Better characterize contamination of soils and ground water at the lagoon, ponds, and active landfill.
7. Determine the volume of waste in the buried lagoon.
8. Design a network of wells to be used for long term monitoring.

2.3 TASK 1: PROJECT PLANNING

~~Four project~~ plans have been prepared to guide the Phase II RI/FS work for the Skinner Landfill site. The four plans include: a Work Plan, a Quality Assurance Project Plan

(QAPP) Addendum, a Sampling Plan (which has been incorporated into the QAPP Addendum as Appendix A) and a Health and Safety Plan.

2.3.1 Work Plan

This work plan has been developed and based on data gaps in the original Phase I RI scope of work, conversations with the U.S.EPA and OEPA, and several site visits. The work plan specifies what additional field investigations need to be performed, general methods to perform the work, personnel requirements, and a schedule for the proposed work.

2.3.2 Sampling Plan

All work conducted during the investigation will be governed by the Work Plan. The Sampling Plan and the Quality Assurance Project Plan (QAPP) Addendum are intended to supplement the Work Plan. The Sampling Plan identifies what additional data are required to conduct the RI/FS. It also includes a statement of sampling objectives and a discussion of sampling locations and analyses to be performed.

2.3.3 Quality Assurance Project Plan (QAPP) Addendum

The QAPP Addendum outlines the quality assurance objectives of the investigation and the specific procedures which will be utilized to ensure that the data gathered at the Skinner Landfill site will meet the goals of accuracy, precision, completeness, and representativeness. The QAPP Addendum also specifies sample handling and shipping requirements.

2.3.4 Health and Safety Plan

All field work conducted on the Skinner Landfill site will be performed in accordance with the guidelines specified in the Health and Safety Plan. The Health and Safety Plan has been developed to minimize any potential hazards to the ARCS investigation team or the surrounding community from activities undertaken during the field investigation. The plan addresses all applicable health and safety requirements and defines personnel responsibilities, protective clothing and equipment needs, operating protocols and procedures, decontamination requirements, training, medical emergency information and other pertinent guidance.

2.3.5 Data Base Development

Laboratory analytical data pertaining to investigations at the Skinner Landfill have been accumulating from 1976 through the present. The data have been gathered by several governmental (local, state, and federal) agencies, and environmental consulting firms subcontracted by the governmental agencies. The data are currently compiled in the form of raw excerpts from the various source documents in Appendix B of this work plan. The data are presented in several reporting formats each specific to the agency, firm, or laboratory that performed the work. Additional analytical data will be generated as a result of the Phase II RI thus adding to various sources and reporting formats.

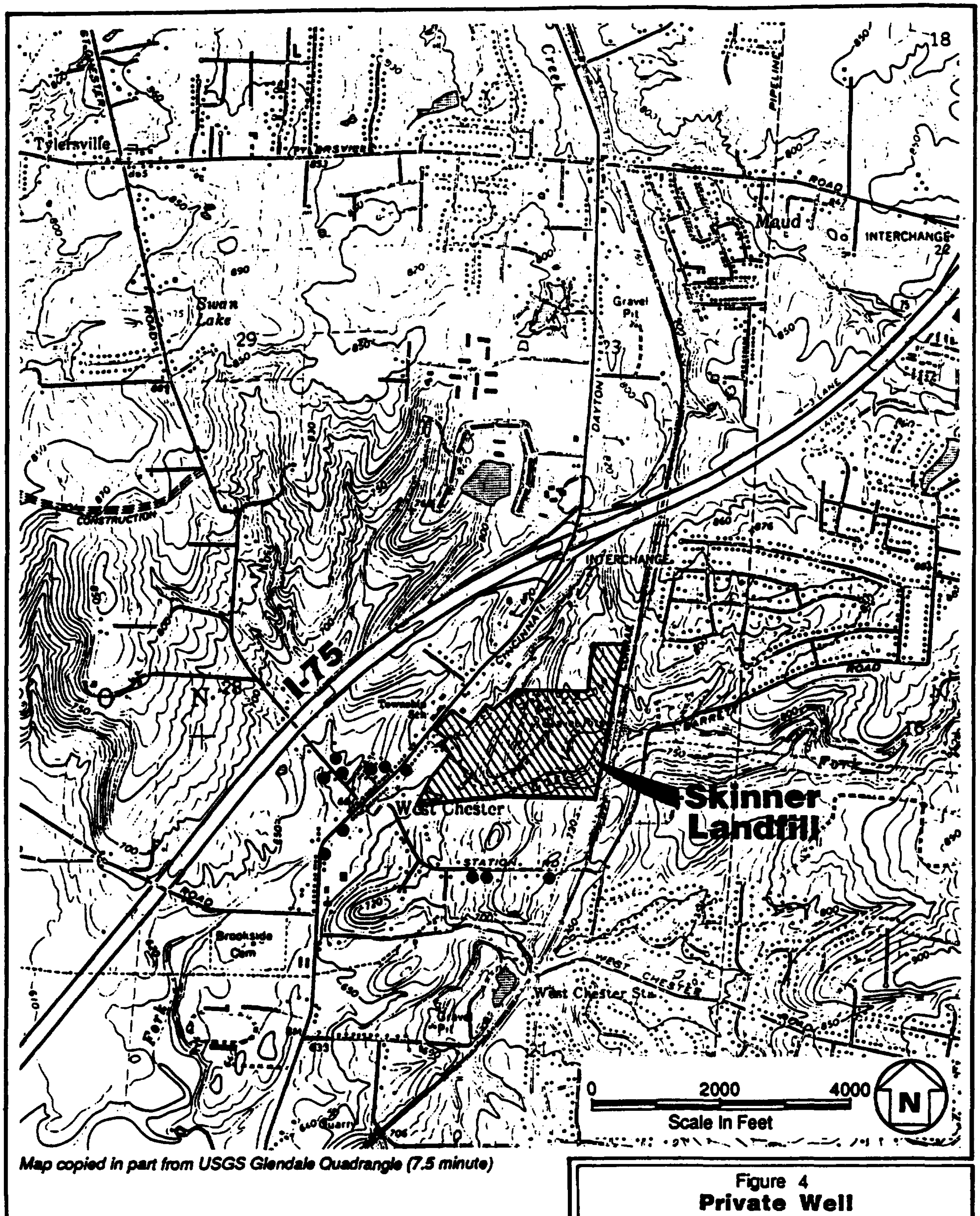
A common data base will be developed that will compile all laboratory analytical data that has been generated for the Skinner Landfill since 1976. The data base will have an Oracle format combining all previous formats into one data base. Data may then be retrieved from a lotus spreadsheet in any format desired. Since data can be manipulated by virtually any field such as sample date, constituent, or depth interval this will allow for an almost unlimited number of report formats. Besides ease of manipulation the data base will provide better data integrity and security, eliminating the possibility of errors due to transferring data from one form of media to another.

2.4 TASK 2 - PHASE II SITE INVESTIGATION

The Phase II field investigation will include both geophysical and hydrogeological investigations in order to further characterize the site. Much of the surficial geophysical work was conducted in Phase I of the RI (see Section 1.1.5.1). Phase II will consist of geophysical well logging, the installation of several ground water monitoring wells, and sampling of ground water, leachate, surface water, stream sediments, soils, lagoon waste and residential wells.

2.4.1 Mobilization

WESTON established an area for a field office with a telephone and electric lines, a designated personnel and equipment decontamination zone and a drum storage area in 1986. Prior to conducting the Phase II portion of the field work, WESTON's field office site will be evaluated for proper design and compatibility with Phase II needs. All appropriate and necessary adaptations, designs and construction will be subcontracted by WWES. WWES will prepare the associated plans and specification for the subcontracted



Map copied in part from USGS Glendale Quadrangle (7.5 minute)

Figure 4
Private Well Sampling Locations
Skinner Landfill
West Chester, Ohio

February, 1989 04003.01

service including the construction of a decontamination pad, ground water monitoring wells, and soil borings.

2.4.2 Residential Well Sampling

During Phase I of the RI, only seven residential wells were sampled. There were no well construction details available for any of these wells, hence, the aquifers in which these wells were completed are unknown. Although it is important to know if a potable residential well is contaminated, it is difficult for investigators to address the problem if well construction details are unknown. During Phase II WWES will attempt to sample 10-20 residential wells downgradient from the site to assess off-site contamination. This sampling program will be coordinated with both the Ohio and U.S. EPA prior to implementation. Only residential wells for which well logs are available will be sampled during the Phase II RI. Tentatively, homes along Station Road and Cincinnati-Dayton Highway have been targeted. An exception to this, however, will be the sampling of four residential wells on-site. Investigators feel that it is imperative to sample the following four wells; Elsa Skinner residence, Ray Skinner residence, Skinner (daughter) residence, and a trailer on the south side of the East Fork of Mill Creek. Because of the close proximity of these wells to areas of concern, there is a high probability that these wells are contaminated. Residential wells for which logs have been found are shown on Figure 4.

2.4.3 Geophysical Surveys

A suite of geophysical logs will be obtained from wells penetrating the shallow bedrock. The logging suite includes gamma, resistivity (both .25 and 2.5 normal), self potential (SP), single point resistance, caliper, temperature logs and hydraulic conductivity testing. The gamma logs will be used to delineate the lithology, as will the resistivity, and single point resistance. The caliper and temperature logs will be used primarily to determine whether fractures are affecting ground water flow in the bedrock. This borehole geophysical data should increase our understanding of the hydrogeology and geology of the shallow bedrock underlying the Skinner Landfill Site.

Hydraulic conductivity testing will also be performed on selected wells in the unconsolidated aquifer where natural sediments, not fill, are encountered. The data gathered as a result of the hydraulic conductivity tests will allow the estimation of ground water flow rates in addition to providing valuable data for the evaluation of remedial alternatives.

2.4.4 Monitoring Wells and Ground Water Sampling

Fifteen additional monitoring wells (see Figure 5) will be installed at the Skinner site to define the ground water flow conditions, determine the extent of contamination, and to estimate the fate of contaminants.

All well installations will be supervised by experienced WWES personnel. Wells will be constructed of stainless steel casings and screens.

A steam cleaner or other appropriate method will be used to decontaminate all equipment between wells. A more detailed discussion of decontamination, and well installation procedures may be found in the Quality Assurance Project Plan Addendum.

The data gathered during the Phase I investigation showed that ground water flows away from the higher elevations toward the streams. The earlier data also showed that a vertical downward gradient existed at a couple of the well locations, and that bedrock fracturing may be influencing flow. Because of these conditions, the deeper ground water may not discharge to the bordering streams, but instead flow beneath the streams. Additional wells are needed in the bedrock to determine whether the deeper ground water that serves nearby residences has been impacted.

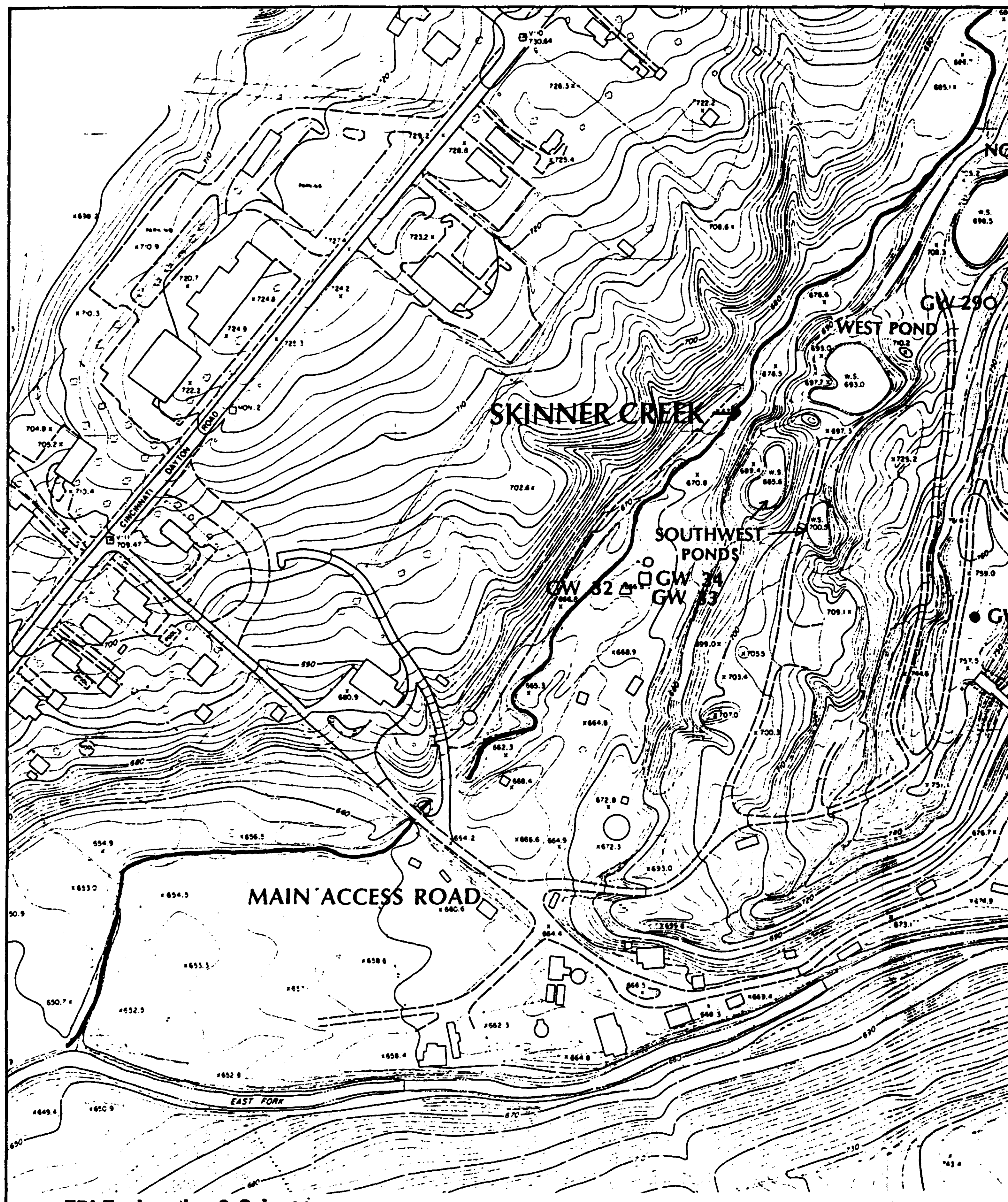
The Phase I data also indicated contaminants exist in the ponds on the western side of the site. Presently, there are no monitoring wells near the western border of the site which could detect possible movement of contamination moving from the pond and into Skinner Creek.

A detailed listing of the proposed new monitor wells for different areas of the site is presented in the following sections.

2.4.4.1 Buried Lagoon Area

- GW28: This well will be installed to replace existing well GW08 which measured dry in August 1986 and July 1987. The top of the open interval of the well will be 5 feet below the water table or several feet below the bottom elevation of well GW08, whichever is deeper at the time of installation.

- GW24 and GW25, GW30 and GW31: Two 2-well clusters will be installed on the south side of the East Fork of Mill Creek at the location



LEGEND

Proposed Monitoring Well	Existing Monitoring Well
○ Shallow	● Shallow
□ Intermediate	▲ Deep
△ Deep	

N

0 100 200 400

Scale in Feet

Figure 5

Monitoring Well Location Map

Skinner Landfill
West Chester Ohio

February, 1989

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shown on Figure 5. Wells GW25 and GW31 will be screened in the shallow fractured bedrock. Wells GW24 and GW30 will be screened near the bottom of the unconsolidated zone just above any clay or silty horizon that may overlay the bedrock. The two well clusters will help determine the fate of contamination migration within the bedrock, and the hydrogeologic relationship between East Fork Mill Creek, the ground water in the unconsolidated soils and ground water in the bedrock.

- GW27: This well will be installed in the fractured bedrock adjacent to existing well GW20. The purpose of this well is to determine if higher concentrations of the contaminants found in bedrock well GW9 are present in the bedrock closer to the likely source, i.e. the buried lagoon.

- GW26: This well will be installed in the fractured bedrock adjacent to existing well GW16.

- GW38: This will be a well installed in the fractured bedrock adjacent to existing wells GW06 and GW07, making a 3 well cluster.

2.4.4.2 Skinner Creek Basin

No monitoring wells currently exist in the Skinner Creek drainage basin; however, contamination has been found in the sediments in the northern pond. We propose the following wells.

- GW29: Monitoring well GW29 will be installed down gradient of the metal storage area as requested by the OEPA.

Two 3-well clusters will be installed adjacent to Skinner Creek to assess the potential for contamination in the Skinner Creek area.

- GW35, GW36, and GW37: These wells will be installed upgradient along Skinner Creek to establish the hydrogeologic relationship between surface water, ground water in the unconsolidated aquifer, and ground water in the bedrock aquifer, and to characterize the geology in the area of Skinner Creek. The intermediate well, GW39, will not be constructed if the bedrock is less than twenty feet below the water table. This well nest will also serve for background comparisons for wells located within the Skinner Creek basin.

- GW32, GW33, & GW34: These wells will be installed on the west bank of Skinner Creek to assess potential contamination from the adjacent ponds and to determine if contaminants are discharging to Skinner Creek. If the bedrock is less than twenty feet below the water table, the intermediate well (GW33) will not be installed. The monitoring wells will help to define the extent of contamination, to characterize the geology, to establish the vertical gradient and to establish the hydrogeologic relationship between the surface water, the ground water in the unconsolidated aquifer, and the ground water in the bedrock aquifer.

2.4.4.3 Active Landfill Area

No new monitor wells are proposed for the active landfill area. This area is upgradient from the buried lagoon and the existing wells are adequate to measure the impact of this area on the ground water.

2.4.5 Soil Sampling

2.4.5.1 Soil Boring for Monitoring Well Installation

Split spoon soil samples will be collected during drilling of the monitoring wells for lithologic description and in some instances for chemical analyses. At well cluster locations, only the deepest well will be sampled by split spoon. Split spoon samples will be collected throughout the unconsolidated portion of the borings at depths of 2.5, 5, 7.5 and 10 feet, and at 5 foot intervals thereafter to the bottom of the borehole or bedrock.

Split spoon soil samples collected above the saturated zone during the drilling of monitoring wells GW26, GW27, GW28, GW29, GW35 and GW38 will be retained for chemical analysis (Figure 6).

Each soil sample collected with the split spoon will be screened with an Hnu and/or OVA meter. If the screening registers two times above the ambient air, or if the soils are visibly stained or have an unusual odor, the sample will be retained for chemical analysis. Samples will be retained for chemical analysis from the top, middle, and bottom of any zone(s) of contamination encountered. The sample(s) will be immediately transferred into the appropriate jars using a decontaminated stainless steel spatula. The samples will <u>not</u> be composited in order to minimize exposure to the atmosphere and prevent the loss of volatiles. A maximum of 5 and a minimum of 1 soil sample collected in the

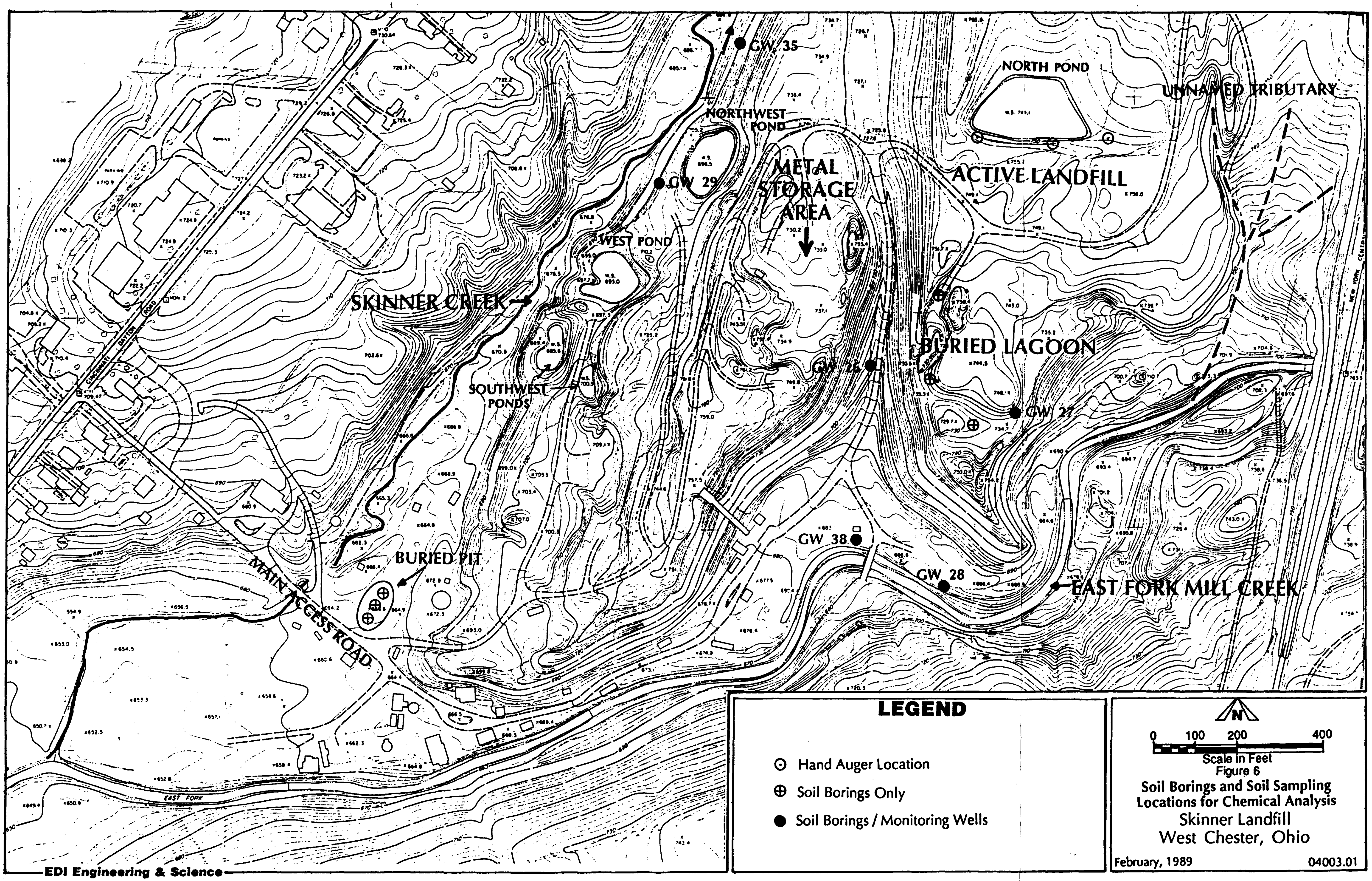


Figure 6
Soil Borings and Soil Sampling Locations for Chemical Analysis
Skinner Landfill
West Chester, Ohio

February, 1989 04003.01

minimum of 1 soil sample collected in the unsaturated zone will be selected for chemical analysis from each borehole. If no split spoon sample fails the "meter, odor, visual" test, then the sample obtained directly at the water table will be selected for chemical analysis. Any remaining samples will be retained in clean jars for lithologic description.

The soil samples will be analyzed for RAS organics, RAS inorganics, and SAS constituents including additional pesticides and TOC. The samples collected from the boreholes adjacent to the lagoon will also be analyzed for dioxin under a SAS request.

The open boreholes will be sealed with cement-bentonite grout upon completion of sampling.

2.4.5.3 Hand Auger Borings

Hand auger soil borings will be performed at three locations shown in Figure 6 between the active landfill and the shallow north pond. Soil samples will be collected from 6 to 12 inches and at 18 to 24 inches below ground surface and retained for chemical analysis.

The resulting analyses will assist in determining the impact of surface runoff from the landfill towards the pond. During one of the site visits, several drums were observed at the base of the fill. One of the three soil boring locations will be drilled next to the drums to determine if the contents of the drums (if any) have impacted the adjacent soils and if so, with what constituents.

These soil samples will be analyzed for RAS organics, RAS inorganics, and SAS constituents including additional pesticides. A total of six investigative and one duplicate sample will be sent for analysis. These shallow borings will be sealed with a mixture of wetted cuttings and bentonite pellets.

2.4.6 Waste Lagoon Sampling

The buried lagoon south of the active landfill most likely poses the greatest potential threat to human health and the environment. The waste in the lagoon has not been sampled since 1976. The lateral and vertical extent of waste in the lagoon has never been definitively determined. Locating and sampling the lagoon will be quite difficult because an estimated 1-1/2 acres of demolition debris, 40 feet in depth now covers the buried lagoon.

Four methods of obtaining samples were evaluated. These methods include; angle drilling, removal of the demolition debris, air rotary, and hollow stem augers. The results of the evaluation of each method are summarized below.

2.4.6.1 Angle Drilling

Drilling could be done at an angle beneath the demolition debris. A drilling rig would be set up south of the buried lagoon to drill beneath the lagoon at an angle. At a minimum angle of 45 degrees from the horizontal, a rig 20 feet from the edge of the lagoon would be 20 feet deep when the drill bit approached the edge of the buried lagoon. Information from the OEPA suggests the lagoon is 20 feet deep; therefore, angle drilling would not intercept the lagoon, but would pass beneath it.

2.4.6.2 Removal of Demolition Debris

Removal of the construction debris would be the most expensive and time consuming alternative. It is estimated that 1 - 1/2 acre of debris 40 feet high is located on top of the buried lagoon. This equals a volume of 96,800 cubic yards. Removal of the demolition debris would be the best option in terms of locating the lagoon. In addition, removal of the demolition debris would allow WWES to consider the placement of a cap over the buried lagoon during the feasibility study.

2.4.6.3 Air Rotary

Conventional air rotary drilling techniques could be employed to drill straight down into the lagoon. The drill rig would be stabilized, if necessary, with wooden mats. Problems associated with air rotary would include keeping the hole open, maintaining circulation in unconsolidated sediments, drilling through concrete, rebar, and steel that are present in the debris, and access.

2.4.6.4 Hollow Stem Augering

Drilling with hollow stem augers would be the best way to sample the buried lagoon if the augers can get through the overlying fill. Hollow stem rigs frequently are mounted on all terrain vehicles and are set-up to drill for environmental sampling. Continuous monitoring of the air for explosive gases would be required. Problems associated with hollow stem auger drilling are the inability of augers to penetrate steel, rebar, and concrete. Several attempts may be necessary before the augers successfully penetrate the fill depending on the frequency and location of impenetrable debris. Given the alternatives we recommend that the hollow stem auger method be tried to sample the lagoon.

2.4.6.5 Sample Collection

The vertical and lateral extent of the wastes buried in the lagoon are currently unknown. The composition of the sludge may vary both vertically and horizontally. For these reasons, a 200' x 200' grid will be established over the area suspected to be directly located over the buried lagoon as shown in Figure 7. Previous information that will be used to site the grid consists of; an aerial photo from 1976 showing the exposed lagoon, and magnetometry, electro-magnetic terrain conductivity and soil gas surveys performed by WESTON during the Phase I RI.

The grid will be separated into 16 separate sections and a grid node established in the center of each section. Hollow stem auger borings will be performed at each grid node to determine the lateral extent of the lagoon and also to allow for vertical sampling if waste is encountered. Drilling will begin at the center sections and work out toward the outer section locations. As the edges of the lagoon are determined, outer section drilling may be eliminated.

At each grid node, drilling will continue until the buried lagoon is reached, at which time split-spoon samples will be collected every 2.5 feet until the bottom of the lagoon is reached. The drilling will be terminated if soil is leached. All drilling and sampling will be monitored with an Hnu or equivalent instrument. Samples will be collected until the soil no longer appears contaminated. A maximum of three samples per auger boring will be selected for chemical analysis. All samples that have odors, discolorations, sheen, or Hnu readings above the ambient readings will be retained. All equipment will be decontaminated in accordance with the QAPP Addendum.

A maximum of 48 samples will be collected for chemical analyses. The lagoon samples will be analyzed for RAS organics, RAS inorganics, and additional SAS parameters.

2.4.7 Surface Water and Sediment Sampling

Sample locations for Skinner Creek are illustrated on Figures 8 and 9. Samples will be collected at upstream and downstream locations along Skinner Creek. The sample locations were selected to obtain adequate data for the establishment of background unsaturated zone will be selected for chemical analysis from each borehole. If no split spoon sample fails the "meter, odor, visual" test, then the sample obtained directly at the water table will be selected for chemical analysis. Any remaining samples will be retained in clean jars for lithologic description.

The soil samples will be analyzed for RAS organics, RAS inorganics, and SAS constituents including additional pesticides and TOC. Samples collected from GW27 will also be analyzed for dioxin under a SAS request.

2.4.5.2 Additional Soil Borings

There are two additional areas where soil samples will be collected with a split spoon sampler and drill rig. Their locations are shown in Figure 6. No monitoring wells will be installed in these borings.

The first area is around the buried lagoon. Three additional soil borings will be drilled around the perimeter of the buried lagoon to gain better spatial control of contamination in the soils adjacent to the lagoon. This information will be useful during the selection and screening of remedial action alternatives.

The second area (buried pit) warranting soil boring exploration has been identified on old aerial photos as a "waste pond." This "waste pond" has subsequently been filled in. Exploration of this "pond" is necessary to determine if it was ever impacted by disposal operations at the Skinner Landfill and to assess the potential for residual contamination leaking out of the pond. Three soil borings will be drilled into the pit. No monitoring wells will be installed in these borings.

The six additional soil borings mentioned above will be drilled using hollow stem augers and sampled with a split spoon sampler until the borehole reaches the water table. Split spoon samples will be collected from the soil borings at depths of 2.5, 5, 7.5 and 10 feet, and at 5 foot intervals thereafter to the water table.

Each soil sample collected with the split spoon will be screened with an Hnu and/or OVA meter. If the screening registers two times above the ambient air, or if the soils are visibly stained or have an unusual odor, the sample will be retained for chemical analysis. The soil will be immediately transferred into the appropriate jars using a decontaminated stainless steel spatula. The samples will not be composited in order to minimize exposure to the atmosphere and prevent the loss of volatiles. A maximum of 5 and a

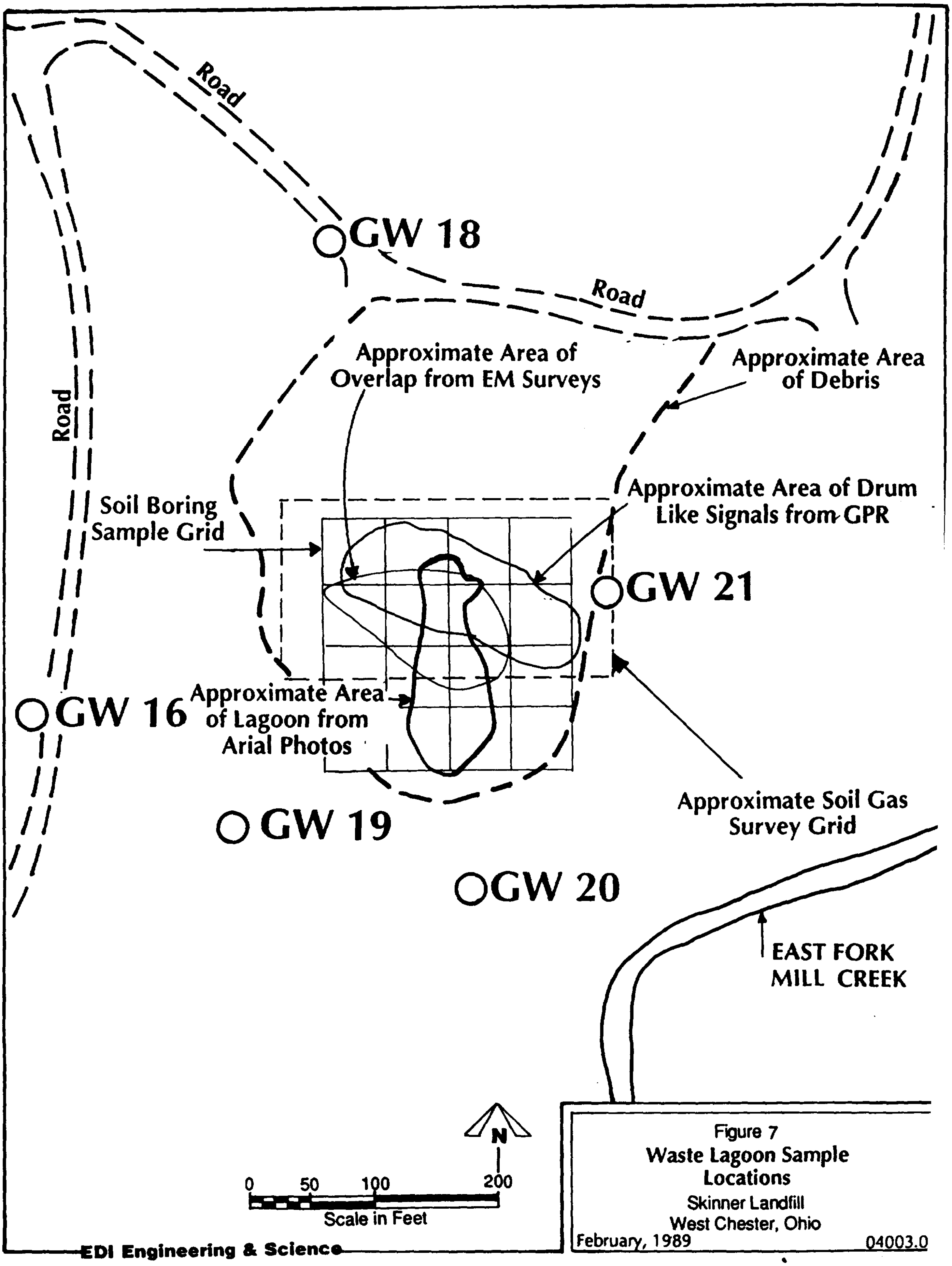
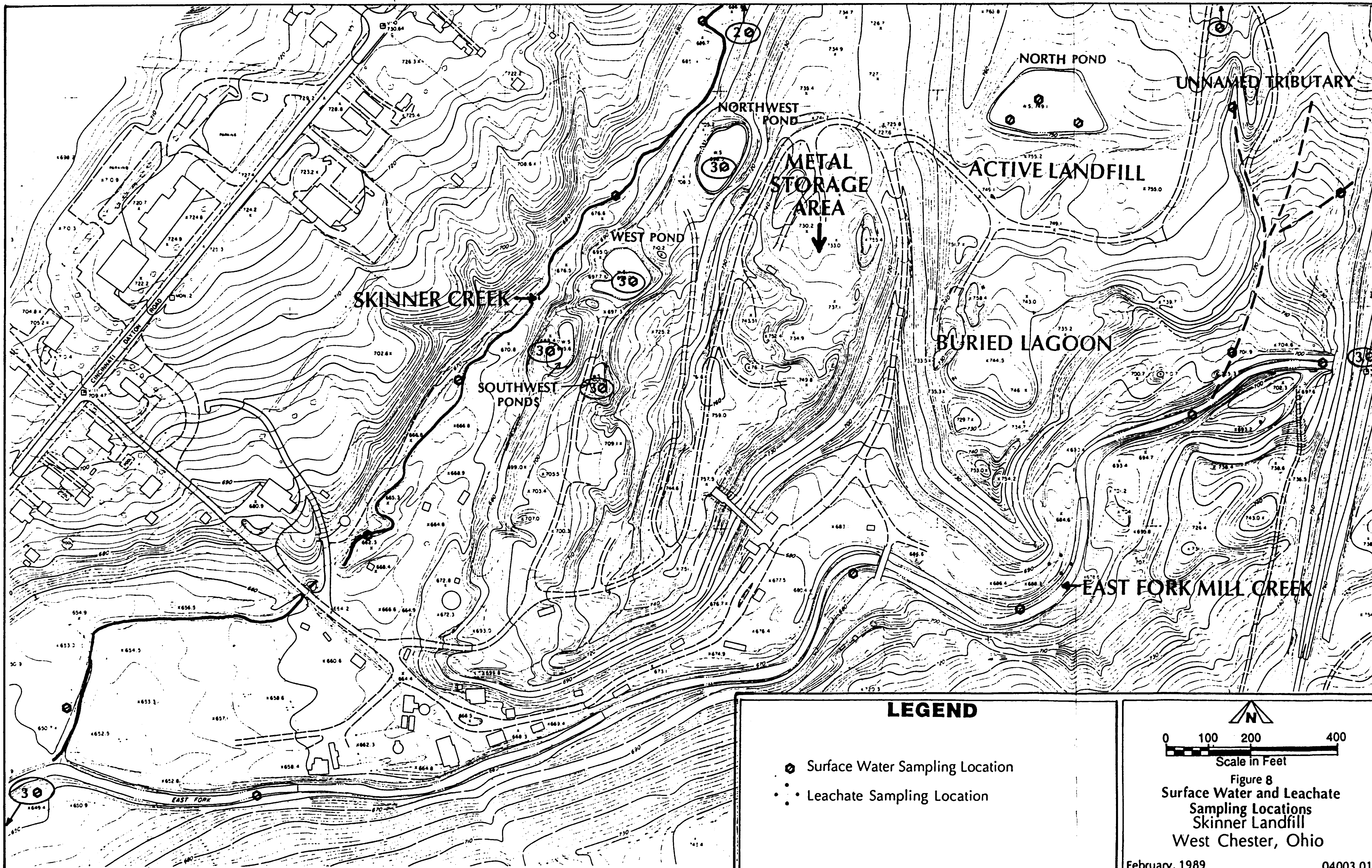


Figure 7
Waste Lagoon Sample Locations
Skinner Landfill
West Chester, Ohio
February, 1989 04003.0



LEGEND

- Surface Water Sampling Location
- Leachate Sampling Location

Figure 8
Surface Water and Leachate Sampling Locations
Skinner Landfill
West Chester, Ohio

February, 1989 — 04003.01

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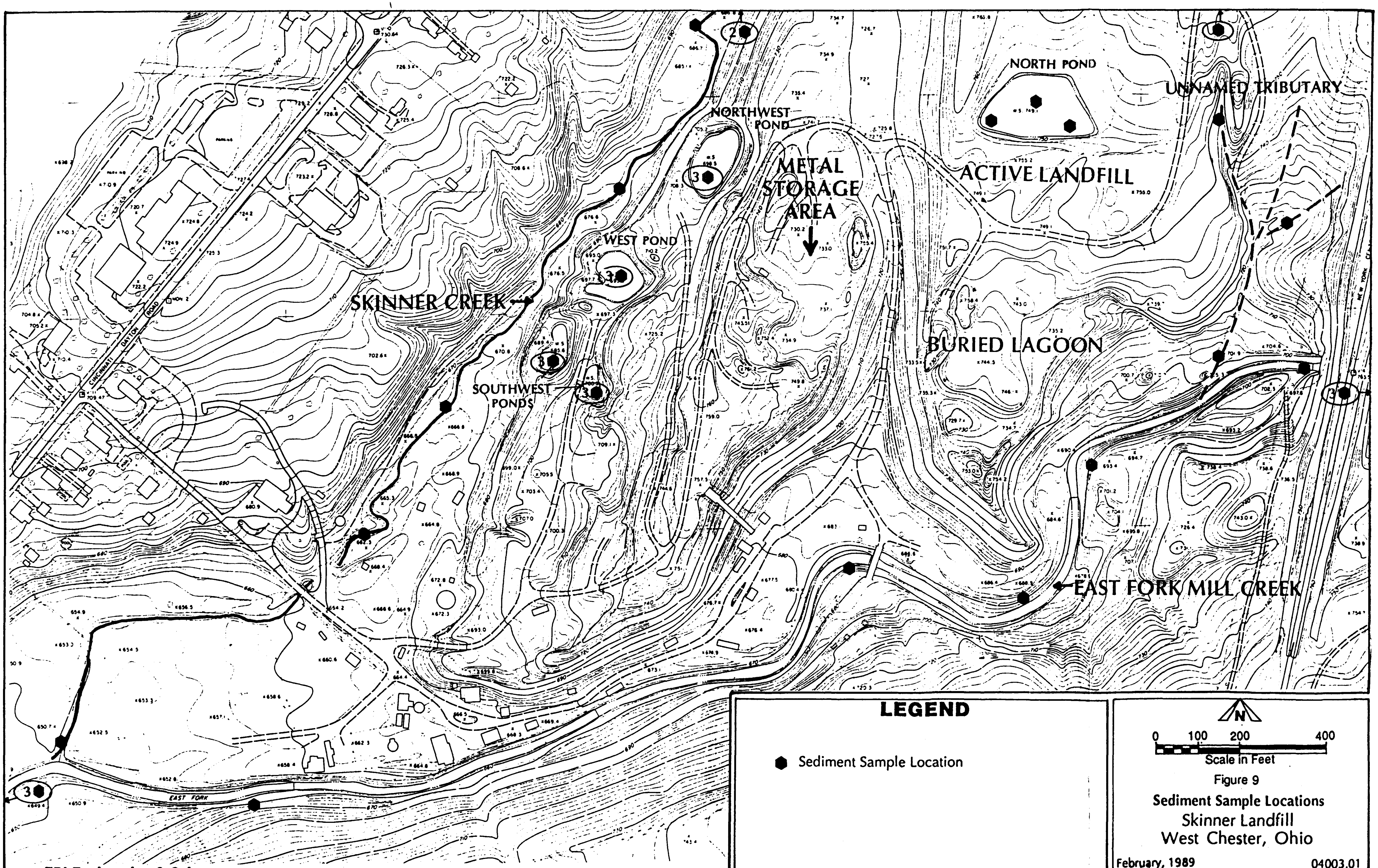

Figure 9

Sediment Sample Locations

Skinner Landfill
West Chester, Ohio

February, 1989 04003.01

values, to facilitate a comparison of Phase II laboratory data with Phase I data, and to assess the extent of contamination downstream from the Skinner Landfill site. In addition, the sample locations were selected to optimize contaminant characterization by WWES personnel experienced in risk assessment. A more thorough discussion concerning sampling techniques is contained in the Sampling Plan.

The East Fork of Mill Creek and an un-named tributary will also be sampled from downstream to upstream locations (see Figure 8 and 9). These additional samples are necessary to characterize the site, verify Phase I data, and establish background values for an adequate risk assessment.

The surface water samples collected from the ponds will be taken from a minimum of two locations and two depth intervals (2 shallow, two deep) and a maximum of three locations and three depth intervals (3 shallow, 3 deep) if the ponds are deeper than 10 feet. Samples will be obtained by using a boat if necessary to access the middle of the ponds. Phase I sampling was restricted to grab samples from the shoreline. This method of vertical sampling is warranted in order to further evaluate depositional history of contaminants (if any) and assess the potential for vertical stratification of contaminants.

Sediment samples will be obtained adjacent to or beneath surface water sampling points. Care will be exercised not to disturb sediments before obtaining samples. Samples will be obtained from stream point bars or similar depositional environments. Sediment samples will be obtained upstream of the site to establish background values for Skinner Creek, the East Fork of Mill Creek, and the unnamed tributary. Additional samples are necessary to verify Phase I data and to use in characterizing the site for the risk assessment. Sediment samples in the ponds need to be collected away from the shore in deeper waters to adequately characterize the contamination previously found during the Phase I RI.

2.4.8 Leachate Sampling

During initial site visits, one leachate seep was observed adjacent to the East Fork of Mill Creek. This was the original seep sampled during Phase I in 1986. This leachate seep and any other seeps observed will be sampled.

It is anticipated that 1 to 3 samples will be collected for chemical analyses. The leachate samples will be analyzed for RAS organics, RAS inorganics, and additional SAS parameters.

2.5 TASK 3 - SAMPLE ANALYSIS/VALIDATION

2.5.1 Quality Assurance for Sample Collection, Handling and Analysis.

The Quality Assurance Project Plan (QAPP) Addendum specifies all sample collection, handling, and shipping methods that will be followed to ensure an end result of quality and defendable data. The QAPP Addendum also references in detail all analytical methods for CLP and non-CLP laboratory analyses that will be used for the Skinner Landfill samples.

2.5.2 Quality Assurance and Data Sufficiency Evaluation

Chemical data validation includes an independent review and quality assessment of the analytical methods performed on the samples. This review will be performed by the Central Regional Laboratory. WWES laboratory staff will summarize the CRL quality assurance laboratory reviews in a form that is intended to be more "user-friendly." This will be used by WWES staff during the data review and preparation of technical memorandums and the RI report.

An additional review will be performed in the field to evaluate the quality of the investigation methods and documentation including performance of monitoring well installation and sample collection methods. This field review will be performed by an experienced WWES professional who is familiar with the field procedures proposed for the Phase II investigation.

WW Engineering and Science has submitted for U.S.EPA approval a Program Management and Quality Assurance Plan that describes how Quality Control and Quality Assurance for deliverables, data analyses, calculations, plans and reporting will be handled. In summary, WW Engineering and Science has in-place a review system to assure that critical elements are reviewed by individuals having appropriate expertise for the task at hand.

2.5.3 Sampling and Analysis Technical Memoranda

Technical memorandums will be prepared after each sampling task. The memorandums will document all sample collection and handling methods. The memorandums will be prepared upon receipt of QA/QC'd sample data from the Central Regional Laboratory. Any deviations from specified collection methods will be fully documented, stating the alternate method used and the rationale behind the selection of the alternate method.

2.6 TASK 4 - ASSESSMENT OF RISKS

The Agency for Toxic Substance and Disease Registry (ATSDR) is required by the Superfund Amendments and Reauthorization Act (SARA) of 1986 to prepare health assessments for sites listed on the NPL. ATSDR will prepare an health assessment for Skinner Landfill based upon information obtained in accordance with this work plan.

WWES will assess the risks posed by the Skinner Landfill site by performing a qualitative human health risk assessment and a qualitative environmental assessment (EA). The public health evaluation and EA will determine the magnitude and probability of actual or potential harm to the public health of nearby residents and to the environment associated with the releases or potential releases of hazardous substances from the Skinner Landfill site.

The results of the health assessment (if available), the human health risk assessment, and EA will be used in the FS portion of the study as the base line upon which to evaluate possible remedial alternatives or technologies.

2.7 TASK 5 - TREATABILITY STUDY/PILOT TESTING

Specific studies to evaluate the applicability of a technology or demonstrate the feasibility of an alternative may be necessary. A literature survey will be conducted to identify existing data on the treatment alternatives under consideration. Where insufficient historical data exists, or where a proven technology is proposed for a new application, bench or pilot scale testing of the proposed alternatives may be necessary to generate data with which to evaluate treatment effectiveness and full-scale costs.

The necessity for bench or pilot scale studies will be further identified during the Phase II RI. Treatability testing which may be considered prior to implementation of any Initial Remedial Measures (IRM) includes:

- Biological treatability testing to determine the potential effects of landfill leachate and/or ground water on the POTW

- Activated carbon isotherms to confirm contaminant removal efficiencies and identify carbon usage rates

- Chemical oxidation bench and/or pilot studies to identify chemical and energy requirements, removal efficiencies, and full-scale treatment costs

- Bench scale precipitation tests for metals removal from leachate and ground water; stabilization tests to reduce metals mobility in soils

- In-place testing of a soil-type and grain-size specification and tile-drain configuration for a subsurface collection drain

A work plan will be prepared for any proposed treatability testing. The bench or pilot scale treatability work plan(s) will be prepared according to the Office of Solid Waste Environmental Response (OSWER) Directive 9355.3-01 Guidance Document. The work plan(s) would be reviewed and approved by the U.S.EPA and OEPA prior to implementing the proposed work.

2.8 TASK 6 - COMMUNITY RELATIONS PLAN

A Community Relations Plan was written in 1984 for the commencement of REM II field activities. This plan should be updated, however, as nearly all of the U.S.EPA agency contact people have been replaced with new personnel. It is further recommended that a new fact sheet be developed reporting the results of the Phase I RI and describing the additional work and rationale for the work that is proposed for Phase II. U.S. EPA Region V personnel will take the lead role for Community Relations events. WWES is not presently requested to perform community relation activities as part of the existing work assignment.

2.9 TASK 7 PREPARATION OF RI REPORT

After completing all study phases and after consultation with U.S. EPA and Ohio EPA, a preliminary Phase II remedial investigation report will be prepared to consolidate and summarize the data obtained and documented in previously prepared technical memoranda during the remedial investigation. The RI Report will also incorporate information contained in the Preliminary Phase I RI prepared by WESTON. The U.S. EPA and OEPA will review and provide comments on the draft document.

In addition to a thorough discussion of the conditions at the site, including characterization of surficial processes, hydrogeologic systems, and nature and extent of contamination, the draft report will present:

- Recommendations regarding whether or not to proceed with the remedial response objectives.
- A discussion of remedial technologies that could be applied to the site.

A draft report will be prepared for submission to U.S. EPA and the OEPA. The report will include the results of the RI and will include any supplemental information in appendices. After receiving the Draft Final Report, a public meeting may be held by the U.S. EPA.

SECTION 3
FEASIBILITY STUDY

3.1 PURPOSE

The purposes of the feasibility study are to evaluate remedial alternatives and to identify the alternative(s) which is protective of human health and the environment and is consistent with the Superfund Amendments and Reauthorization Act of 1986 (SARA). This Work Plan describes the technical approach to the FS and lists preliminary potential remediation technologies which will be screened and evaluated. The criteria to be used to screen and evaluate the remedial action alternatives will also be discussed.

Phase I remedial investigation activities were initiated in 1984 by WESTON. Phase II RI activities were never fully implemented due to changing site conditions and deficiencies in the Interim Phase I RI report. The Phase II RI activities which will be implemented under this Work Plan will provide the site characterization data required to develop and screen remediation alternatives.

3.2 SCOPE

The FS will consist of three tasks:

- Task 8: Remedial Alternatives Development and Screening
- Task 9: Remedial Alternatives Evaluation
- Task 10: Feasibility Study Report

The work plan to accomplish each task is described below.

3.3 FEASIBILITY STUDY TASKS

3.3.1 Task 8 - Remedial Alternatives Development and Screening

The primary objectives of this task are to develop alternatives that are protective of human health and the environment and to narrow the list of potential alternatives that will be developed in detail. A number of remedial action alternatives have been developed based on the results of the Phase I RI and the list of potentially feasible technologies developed during project planning. This preliminary list of alternatives may be subsequently modified or refined during later FS phases as additional information on site conditions becomes available.

3.3.1.1 Development of Remedial Action Objectives

Remedial action objectives will be developed which specify the contaminants and media of interest, exposure pathways, and remediation goals. These objectives will be based on contaminant - specific ARARs, when available, and risk-related factors. Guidance used to develop these objectives will include Section 300.68 of the National Contingency Plan (NCP), EPA's interim guidance, and the requirements of other applicable Federal and State environmental standards, guidance, and advisories as defined under SARA, Section 121.

Objectives for source control measures will be developed to prevent or significantly minimize migration of contamination from the site. Objectives for off-site measures will be developed to prevent or minimize the significant impacts of contamination that has migrated from the site. Preliminary clean-up objectives will be developed in consultation with the U.S. EPA, the OEPA and the local public. The following preliminary remedial action objectives have been established:

- Prevent further contamination of the unconsolidated and bedrock aquifers by leachate from the active landfill and

- Prevent further migration of contaminants from the buried lagoon.

3.3.1.2 Development of General Response Actions

General response actions are medium-specific actions that will satisfy remedial action objectives. General response actions will be defined and refined throughout the RI/FS as a better understanding of the site is obtained and ARARs are identified. The following preliminary general response objectives have been established:

- Collection of landfill leachate to avoid further contamination of the unconsolidated and bedrock aquifers.

- Removal or remediation of contamination sources within the buried lagoon and capping the area to prevent further source migration.

3.3.1.3 Identification of Volumes or Areas of Media

Areas of media to which general response actions maybe applied were identified during the Phase I RI. These areas include the buried lagoon, the active area of the landfill, the central shoulder area, and the ponds. These areas and others, as appropriate, will be evaluated further during the RI/FS to determine volumes.

3.3.1.4 Identification and Screening of Remedial Technologies

A comprehensive list of feasible remedial technologies will be prepared based on site characterization information on contaminant types and concentrations and site characteristics. Table 3 is a preliminary list of potentially feasible technologies. This list will be revised as necessary during the RI/FS.

3.3.1.5 Evaluation of the Effectiveness of Identified Technologies

The identified technologies will be evaluated to determine:

- The potential effectiveness of the technology in handling the estimated areas or volumes of media,

- The effectiveness of the technology in protecting human health and the environment during the construction and implementation phase, and

- The reliability of the technology with respect to site-specific conditions.

3.3.1.6 Evaluation of the Implementability of Remedial Technologies

The institutional implementability of the identified technologies will be evaluated to determine if a proposed technology may be unworkable. Factors evaluated will include:

- Ability to obtain necessary permits for off-site actions,

TABLE 3

POTENTIALLY FEASIBLE TECHNOLOGIES

Environmental Media	Remedial Response Action	Remedial Technology
Surface Soils	No Action	None
	Access Restrictions	Deed restrictions
		Site fencing
		Monitoring surface run-off
	Diversion	Surface Controls: Grading
		Revegetation
		Soil Cover
		Flood Control Dikes
	Containment	Capping: Single Layer Cap Synthetic membrane
		Clay
		Asphalt
		Concrete
		Chemical sealant/ stabilizer
		Multilayer Caps Multimedia
	Removal	Excavation
	On-Site Treatment	Incineration: Rotary kiln
		Liquid injection

TABLE 3 (cont.)

POTENTIALLY FEASIBLE TECHNOLOGIES

Environmental Media	Remedial Response Action	Remedial Technology
Surface Soils (cont.)	On-Site Treatment (cont.)	
		Fluidized bed
		Infrared
		Advanced Electric Reactor
		Chemical detoxification
	In-Situ Treatment	Microbial degradation
		Chemical detoxification
		Fixation/Solidification
		Soil washing
		Soil aeration
		Solution mining
		Soil vapor extraction
		Vitrification
	Off-Site Treatment	
		RCRA Incineration
	On-Site Disposal	
		RCRA Landfill
	Off-Site Disposal	
		RCRA Landfill
Disposal Area Contents	No Action	None
	Access Restriction	
		Deed restrictions
		Site fencing

TABLE 3 (cont.)

POTENTIALLY FEASIBLE TECHNOLOGIES

Environmental Media		Remedial Response Action	Remedial Technology
	Disposal Area Contents (cont.)	Access Restriction (cont.)	
			Monitoring surface run-off
		Diversion	
			Surface Controls: Grading
			Revegetation
			Soil Cover
			Flood Control Dikes
		Containment	
			Capping: Single Layer Cap Synthetic membrane
			Clay
			Asphalt
			Concrete
			Chemical sealant/ stabilizer
			Multilayer Cap: Multimedia
			Vertical Barriers: Slurry wall
			Vibrating beam asphalt wall
			Grout curtain
			Sheet metal piling
			Concrete wall
			Clay wall

TABLE 3 (cont.)

POTENTIALLY FEASIBLE TECHNOLOGIES

Environmental Media	Remedial Response Action	Remedial Technology
Disposal Area Contents (cont.)	Containment (cont.)	
		Horizontal Barriers: Block displacement
		Injection grouting
	Removal	
		Excavation
	On-Site Treatment	Incineration: Rotary kiln
		Liquid injection
		Fluidized bed
		Infrared
		Advanced Electric Reactor
		Chemical detoxificaiton
		Fixation/Solidification
		Soil washing
		Photolysis
	In Situ Treatment	Microbial degradation
		Chemical detoxification
		Soil aeration
		Solution mining
		Soil vapor extraction
		Vitrification

TABLE 3 (cont.)

POTENTIALLY FEASIBLE TECHNOLOGIES

Environmental Media	Remedial Response Action	Remedial Technology
Disposal Area Contents (cont.)		
	Off-Site Treatment	RCRA Incineration
	On-Site Disposal	RCRA Landfill
	Off-Site Disposal	RCRA Landfill
Groundwater	No Action	None
	Access Restrictions	Deed Restrictions
		Site Fencing
		Groundwater Monitoring
	Diversion	Grading
		Revegetation
		Soil Cover
		Flood Control Dikes
	Containment	Capping: Single Layer Cap Synthetic membrane
		Clay
		Concrete
		Chemical sealant/ stabilizer
		Multi Layer Cap Multimedia

TABLE 3 (cont.)

POTENTIALLY FEASIBLE TECHNOLOGIES

Environmental Media	Remedial Response Action	Remedial Technology
Groundwater (cont.)	Containment (cont.)	
		Vertical Barriers: Slurry wall
		Vibrating beam asphalt wall
		Grout curtain
		Sheet metal piling
		Concrete wall
		Horizontal Barriers: Block Displacement
		Injection grouting
		Gradient Controls: Barrier Wells
	Collection	
		Injection/extraction wells
		French drains
	On-site Treatment	Biological treatment: Activated sludge
		Trickling filter
		Rotating biological contactors
		Aerated lagoons
		Biophysical (PACT)
		Chemical treatments: Neutralization
		Precipitation

TABLE 3 (cont.)

POTENTIALLY FEASIBLE TECHNOLOGIES

Environmental Media	Remedial Response Action	Remedial Technology
Groundwater (cont.)	On-Site Treatment (cont.)	
		Dechlorination
		Oxidation
		Reduction
		Physical treatment: Coagulation/ Sedimentation
		Carbon adsorption
		Activated alumina
		Ion exchange
		Reverse osmosis
		Air stripping
		Steam stripping
		Filtration
		Dissolved air flotation
		Extraction
		Solar evaporation
		Spray evaporation
		Effluent Disposal: Publicly owned treatment works
		Direct discharge
	In-Situ Treatment	Microbial degradation
		Limestone treatment bed

TABLE 3 (cont.)

POTENTIALLY FEASIBLE TECHNOLOGIES

Environmental Media	Remedial Response Action	Remedial Technology
Groundwater	In-Situ Treatment (cont.)	
		Activated carbon bed
		Chemical treatment
	Off-site Treatment	Publicly-owned Treatment Works Yes
		RCRA Facility
	On-Site Disposal	
		Direct discharge
	Off-Site Disposal	
		Deep well injection
	No Alternative Water Supply	
		Bottled water
		Tie in to municipal water system
		Individual treatment units
Air	No Action	None
	Access Restrictions	
		Deed Restrictions
		Site Fencing
	Containment	
		Capping: Single Layer Cap Synthetic membrane
		Clay
		Concrete
		Chemical sealant/ stabilizer

TABLE 3 (cont.)

POTENTIALLY FEASIBLE TECHNOLOGIES

Environmental Media	Remedial Response Action	Remedial Technology
Air (cont).	Containment (cont)	
		Multi Layer Cap Multimedia
	On Site Treatment	
		Active Gas Collection/ Recovery
		Adsorption
		Absorption
		Catalytic Incineration

- The availability of treatment, storage, and disposal services, and
- The availability of necessary equipment and skilled workers to implement the technology.

3.3.1.7 Evaluation of Cost

Cost plays a limited role in the preliminary screening of technologies. Relative capital and O & M costs will be used rather than detailed estimates. The cost analysis will be based on engineering judgement and each technology will be evaluated as to whether the cost is high, medium, or low as relative to other technologies.

3.3.1.8 Remedial Alternatives Screening

The objective of this process is to narrow the list of potential alternatives that will be evaluated in detail. The screening process aids in streamlining the feasibility study while ensuring that the most promising alternatives are being evaluated. This process is a continuation of the technology evaluation process described in 3.3.1.

During the first phases of this task, specific technologies were evaluated against specific remedial action objectives. During alternative screening, the entire alternative will be evaluated based on its effectiveness, implementability, and cost. Alternatives developed will include the following, as appropriate:

- Treatment alternatives for source control that would eliminate the need for long-term management (including monitoring).
- Alternatives involving treatment as a principal element to reduce the toxicity, mobility, or volume of site waste.
- Alternatives for off-site treatment or disposal.
- Alternatives which <u>attain</u> applicable and/or relevant Federal and State public health or environmental standards.

- Alternatives which exceed applicable and/or relevant Federal and State public health or environmental standards.

As a minimum, the following alternatives will also be developed.

- An alternative that involves containment of waste with little or no treatment, but provides protection of human health and the environment primarily by preventing potential exposure or reducing the mobility of the waste.

- A no action alternative.

The alternatives developed may overlap in some areas. Further, alternatives outside of the above categories may also be developed. The alternatives shall be developed in close consultation with the EPA and the OEPA. The rationale for excluding any remedial action technology identified earlier will be documented in the development of alternatives.

During the initial stages of Phase II, a Focused Feasibility Study (FFS) will be prepared to evaluate a limited number of Initial Remedial Measures (IRM's) which may be implemented prior to the completion of the FS, at the request of the U.S. EPA. These IRM's would include:

- Collection and disposal of landfill leachate

- Treatment of leachate prior to disposal

- Excavation and disposal of material contained in the former lagoon.

IRM's would be evaluated to satisfy the preliminary remedial action objectives. The FFS would undergo review by the U.S.EPA and OEPA prior to implementation of any IRM's.

3.3.1.9 Evaluation of Effectiveness

Only those reliable alternatives that satisfy the response objectives and contribute substantially to the protection of public health, welfare, or the environment will be considered further. Alternatives posing significant adverse environmental effects will be excluded. Alternatives to be considered further must attain or nearly attain Federal and State ARAR's and must significantly and permanently reduce the toxicity, mobility or volume of hazardous constituent.

3.3.1.10 Evaluation of Implementability

Alternatives that may prove extremely difficult to implement, or will not achieve the remedial objectives in a reasonable time period, or that rely upon unproven technology, will be modified or eliminated.

3.3.1.11 Evaluation of Cost

An alternative whose cost far exceeds that of other alternatives will usually be eliminated unless significant benefits may also be realized.

The cost screening will be conducted only after the environmental and public health screening have been performed. Total costs will include the cost of implementing the alternatives and the cost of operation and maintenance.

3.3.1.12 Selection of Alternatives

To determine the appropriate remedial actions at the Skinner Landfill, consideration must be given to the requirement of other federal and state environmental laws. The remedial action must meet applicable or relevant and appropriate environmental or public health requirements (ARAR's) as required by CERCLA Section 121. The alternatives array document will be prepared and submitted to the appropriate federal and state agencies. The responses to the alternatives ARAR document will be reviewed to determine the site specific requirements for each alternative. Included in this document will be a brief history and site background, a site characterization indicating contaminants, pathways, and receptors and other pertinent site features. The alternatives will be summarized in an array for comparison.

3.3.2 Task 9 - Remedial Alternatives Evaluation

Each alternative will be evaluated on a technical, environmental, public health, institutional, and cost basis. The alternatives will then be compared based on several criteria and ranked such that the most cost-effective alternative meeting all criteria is chosen.

3.3.2.1 Remedial Alternative Detailed Analysis

The alternatives that remain after completion of Task 8 will be subjected to a detailed analysis. The analysis will take into account short-term effectiveness, long-term effectiveness and permanence, reduction of toxicity, mobility, or volume, implementability, cost, compliance with ARARs, overall protection to human health, state acceptance, and community acceptance. For purpose of budget development, it is assumed that up to five alternatives will be subjected to the detailed analyses described in Task 9.

- Short-term Effectiveness Evaluation

  The evaluation of short-term effectiveness includes determining the effectiveness of the alternatives during construction and implementation phases until remedial response objectives are met.

  Protective measures revaluation will address the following areas of concern:

  - Protection of surrounding community and environment and site workers during construction of the alternative.

  - Protection of community and environment from hazardous substances remaining after implementation of the alternative.

  - Protection of workers during operation and maintenance of the alternative.

- Long-term Effectiveness and Performance Evaluation

- Long-term effectiveness addresses the results of the remedial action in terms of residual risk after response objectives have been met. The components of long-term effectiveness will be identified for each alternative as follows:

  - Magnitude of remaining risk from untreated waste or treatment residuals.
  - The adequacy and suitability of controls that are used to manage treatment residuals or untreated wastes.
  - The long-term reliability of management controls for providing continued protection from residuals.

- Reduction of Toxicity, Mobility, or Volume

- Contaminant reduction will aim to reduce the mobility, toxicity, or volume of the contaminants. The analysis will favor treatment technologies that produce permanent solutions such as alternative treatment technologies or resource recovery technologies.

- Implementability

  Implementation analysis will review the technical and administrative feasibility of the alternative along with the availability of the system.

- Technical feasibility will consider:

  - Constructability of the technology.
  - Relation to additional remedial action.
  - Ability to monitor the effectiveness of the remedy.
  - Maintainability of equipment.

Administrative feasibility will examine the likelihood of favorable community response and the ability of related agencies to obtain approval for site access and to coordinate activity related to the project.

The review of system availability will indicate whether or not the necessary equipment and specialists are available. If the solution requires long-term operation of a treatment, storage, and disposal (TSD) service, then the review must assure that long-term capacity will be available.

- Cost

  The financial analysis will consider the cost associated with the following aspects of the project:

  - Capital costs associated with development and construction.
  - Operation and maintenance.
  - Present worth analysis.
  - Cost sensitivity analysis.

- ARAR Compliance

  Federal and state responses to the alternatives array submittal will be considered in the detailed analysis of alternatives. Each alternative will be analyzed in view of the contaminant-specific, action-specific, and location-specific requirements identified during ARAR review.

- Overall Protection of Human Health

  The final assessment will be made to check whether each alternative meets the requirements that it is protective of human health and the environment. The emphasis of this analysis is on long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

- State Acceptance

  This section of the detailed evaluation is limited to the analysis of formal comments made by the OEPA during previous phases of the RI/FS. Documentation in the FS Report should include such details as meetings, opportunities for agency review, and transmittal of comments between the U.S.EPA and OEPA.

- Community Acceptance

  The section is used to address those features of the alternatives the community supports, has reservations about, or opposes.

3.3.2.2 Comparative Evaluation of Acceptable Alternatives

The analysis performed for each alternative in Task 10 will be combined in order to rank alternatives and support a recommendation. The relative performance of each alternative will be evaluated in relation to each specific evaluation criteria. The advantages and disadvantages of each alternative to one another will be clearly identified. The comparative analysis of the alternatives will be presented in a narrative discussion and will include a description of the following:

- Strengths and weaknesses of the alternatives relative to one another with respect to each criteria.
- How reasonable variations of key uncertainties could change the expectations of their relative performance.
- Differences between the alternatives measured either qualitatively or quantitatively.
- Substantive differences among the alternatives.

The evaluation of innovative technologies shall include a description of their potential advantages in cost or performance and the degree of uncertainty in their expected performance.

The ranking system will provide each consideration a weight to allow a cost/benefit analysis to be performed. Incremental cost/benefit analysis and decision analysis are each described below.

- Cost-effectiveness Analysis

  A cost/benefit (C/B) analysis will be performed on the alternatives so that selection of an alternative can be made that provides the most cost-effective alternative with a favorable balance between protection of public health, welfare, and the environment. The C/B analysis will be evaluated with potential synergistic considerations of the sensitivity analysis.

- Decision Analysis (Sensitivity Analysis)

  A sensitivity analysis in conjunction with a C/B analysis will be used to screen the alternatives for selection. The variables to be evaluated for selection of the alternatives will be analyzed as to their weight (criticalness) in allowing an alternative to be viable.

3.3.3 Task 10 - Feasibility Study Report

A preliminary report will be prepared presenting the results of the FS and recommending a remedial alternative(s). Copies will be submitted to the U.S. EPA and the OEPA. The U.S. EPA and the OEPA will review and provide comments on the draft document.

A draft final report will be prepared for submission to U.S EPA and the OEPA. The report will include the results of the FS and will include any supplemental information in appendices. This report will recommend a remedial alternative(s). After receiving the Draft Final Report, public comment will be sought by the U.S. EPA and a responsiveness summary will be prepared by U.S.EPA. A public meeting will be held during the public comment period to discuss the Draft Final Report and recommended remedial alternative. Minor, if any, changes in the report would be made after the responsiveness summary.

The report will include detailed discussions of findings under each task and will document the site-specific factors used for evaluating and eliminating alternatives and technologies.

At the present time, this Work Plan does not include preparation of a responsiveness summary nor ROD preparation support. These items are not part of the existing Work Assignment.

3.3.4 Task 11 - Close Out

SECTION 4
PROJECT TEAM ORGANIZATION

Figure 10 portrays the functional organization chart for this RI/FS project. A large group of people having diverse expertise will be required to successfully complete the project. Most of the people will come from within the U.S. EPA and WW Engineering and Science. Subcontractor services will also be required as noted in Figure 10.

Responsibilities of the project's principal units are as follows:

U.S. EPA

- Provide authority and financial resources necessary to conduct RI/FS.
- Review and approve the technical approach to completing the study.
- Provide technical and quality assurance support.
- Provide assistance in contacts with the public.
- Assume lead role for community relations.
- Obtain site access permission.
- Review and approve study findings.
- Identify environmental standards/ARARs, provide applicable guidance.

OHIO EPA

- Review and approve the technical approach to completing the study.
- Review and approve study findings.
- Review remedial response alternatives to help identify response objectives.
- Identify the State environmental standards/ARARs.

WW Engineering and Science ARCS Program Management Office and QA Team

- Review and approve the technical approach to completing the project.
- Assure that project employees have been properly trained and have the expertise needed to perform their assigned tasks.
- Provide technical support services to the project team as needed.
- Audit work progress and review study results to assure that the work conforms to accepted QA/QC provisions.

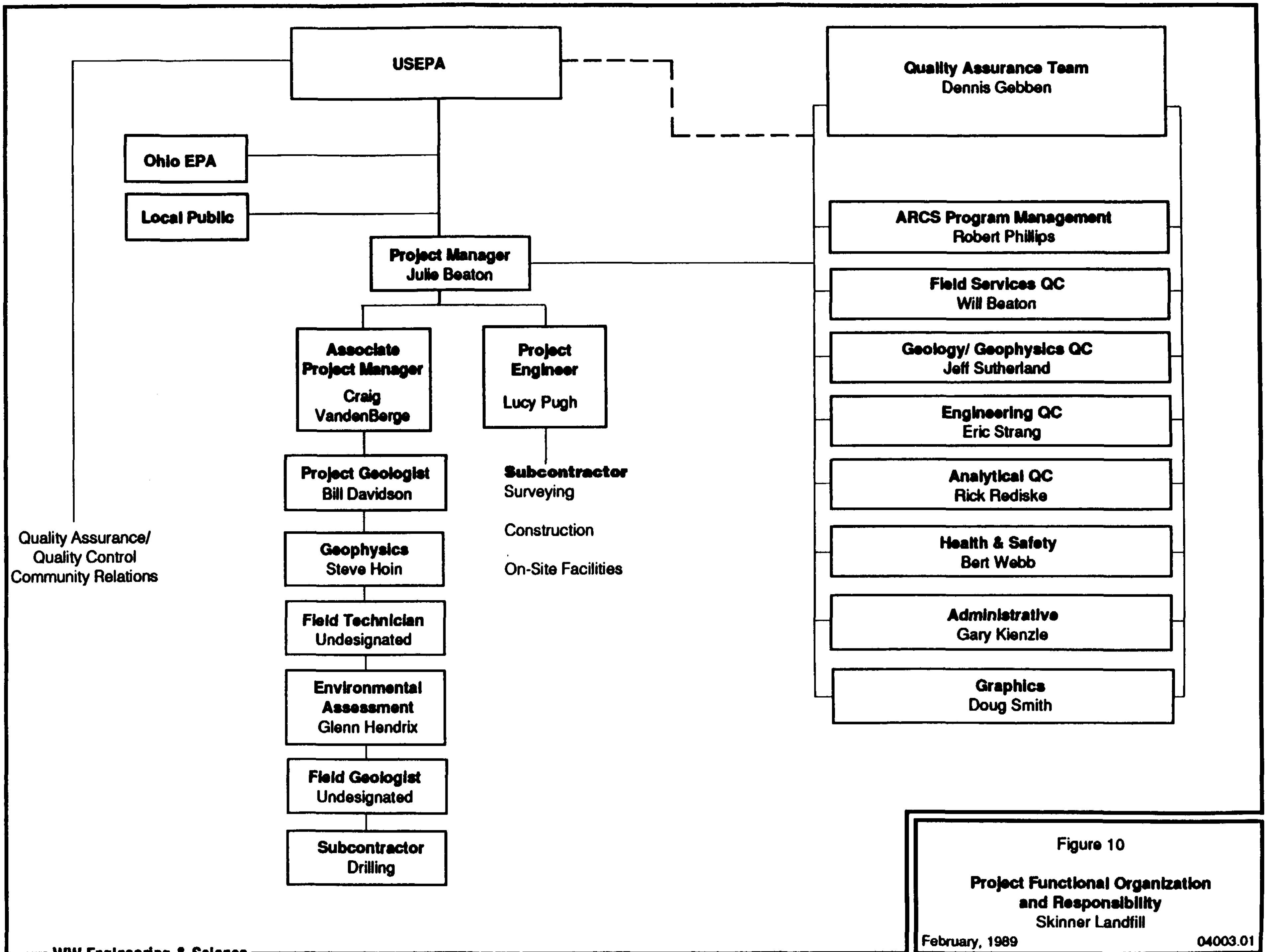

Figure 10

Project Functional Organization and Responsibility

Skinner Landfill

February, 1989 04003.01

WW Project Manager

- Ensure technically sound, defensible, complete deliverables.
- Manage the technical project team and assure that deadlines are met, quality control is observed, and budgets are met.
- Arrange for support services as needed.
- Provide U.S. EPA with project management reports.

WW Project Geologist and Engineer

- Perform or technically supervise the performance of the work identified in the Work Plan.
- Assure that data collection and data interpretation activities conform to the QAPP Addendum and Health and Safety Plan.
- Anticipate technical problems and recommend solutions.

The responsibilities of groups and individuals may change as the RI/FS study progresses. Such changes are anticipated in order to benefit from specialized expertise of various staff members. The monthly report will indicate any significant changes that occur.
The following individuals have been assigned to leadership positions in the project:

ARCS Program Manager: Robert Phillips
Project QA Team: Dennis Gebben
RI/FS Site Project Manager: Julie Beaton
Associate Project Manager: Craig VandenBerge
Project Engineer: Lucy Pugh
Project Geologist: Bill Davidson
Environmental Assessment Coordinator: Glenn Hendrix
Geophysicist: Steve Hoin

Biographies for each of these individuals are included in Appendix C.

SECTION 5
SCHEDULE

The tentative schedule for the RI/FS is shown in Figure 11. This schedule may be revised as the work progresses due to the following:

- interim authorization of parts of the RI
- climate extremes which prevent work, i.e. tornadoes, thunderstorms, low or high temperatures
- technical changes implemented under advice of the U.S. EPA, the OEPA or WWES
- Schedule changes if they become necessary, will be documented and presented in the monthly reports.

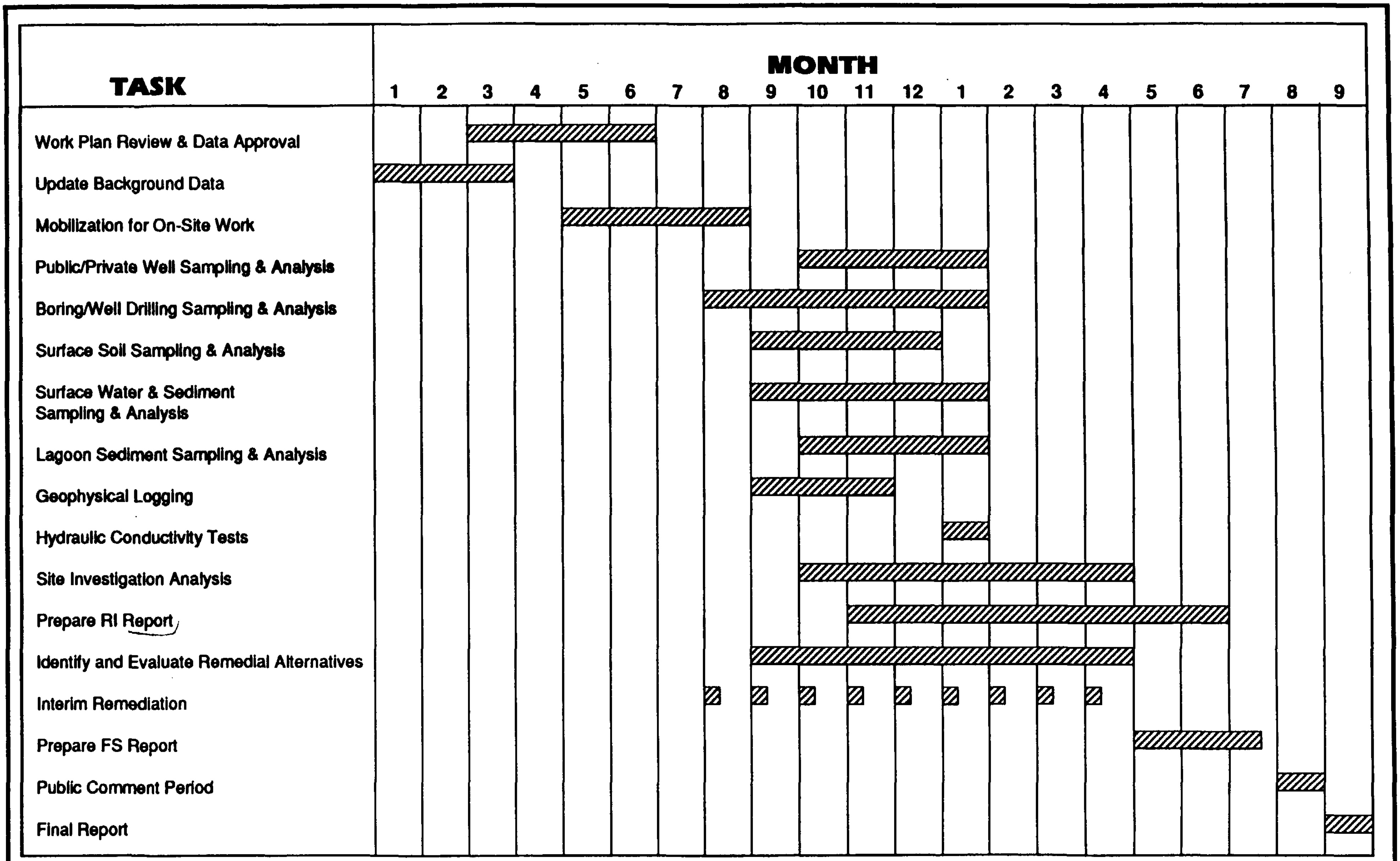

Figure 11

SKINNER LANDFILL
RI/FS Schedule

SECTION 6
REFERENCE DOCUMENTS

1) Butler County Office of Water and Sewer. Map of Sanitary Sewer, East Fork of Mill Creek Drainage Area.

2) Bouwer, H. and R.C. Rice (1976). A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. Water Resources Research V.12 No. 3, 423-428..

3) CH2M Hill. May 13, 1983. Remedial Action Master Plan; Skinner Landfill Site. Prepared for U.S.EPA under contract no. 68-01-6692.

4) Dennis, S.T., (1987). The Effect of Well Efficiency on In-Situ Permeability Test Results. Masters Thesis, Western Michigan University, p.56.

5) G.J. Thelen, PSC. November 5, 1980. Subsurface Survey, Section 13, Dalewood Subdivision. Upper Mill Creek Regional Wastewater Facility, Butler County, Ohio.

6) Hosler, Jeffrey L., (1976), Report of Geology and Ground Water Resources, West Chester, Butler County, Ohio.

7) Kucera International 1985. Topographic Map of Skinner Landfill. Prepared for U.S.EPA under contract no. 68-01-6939.

8) Roy F. Weston, Inc. July, 1985. Sampling and Analysis Plan; Skinner Landfill; West Chester, Ohio. Prepared for U.S.EPA

9) Roy F. Weston, Inc. August, 1985. Work Plan; Skinner Landfill; West Chester, Ohio; Volume I - Technical Scope of Work. Prepared for U.S.EPA under contract no. 68-01-6939.

10) Roy F. Weston, Inc. July 20, 1988. Site Assessment for the Skinner Landfill, Union Township, Butler County, Ohio. Prepared for U.S.EPA under contract 68-01-7367.

11) Roy F. Weston, Inc. December, 1988. Phase I Interim Remedial Investigation Report. Prepared for U.S.EPA under contract no. 68-01-6939.

12) Roy F. Weston, Inc. January, 1989. Round 3 Sampling Data Tables.

13) U.S. Geological Survey. 1982. Glendale Quadrangle, Ohio. Topographic Map. 7.5 minute series.

14) U.S. Environmental Protection Agency. Aerial Photographic Analysis of a Waste Disposal Site, West Chester, Ohio.

15) Verschueron, Karel. 1983. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Company. New York, New York.

APPENDIX A

BORING LOGS FROM H. C. NUTTING COMPANY (1977)

AND FIT INVESTIGATION (1982)

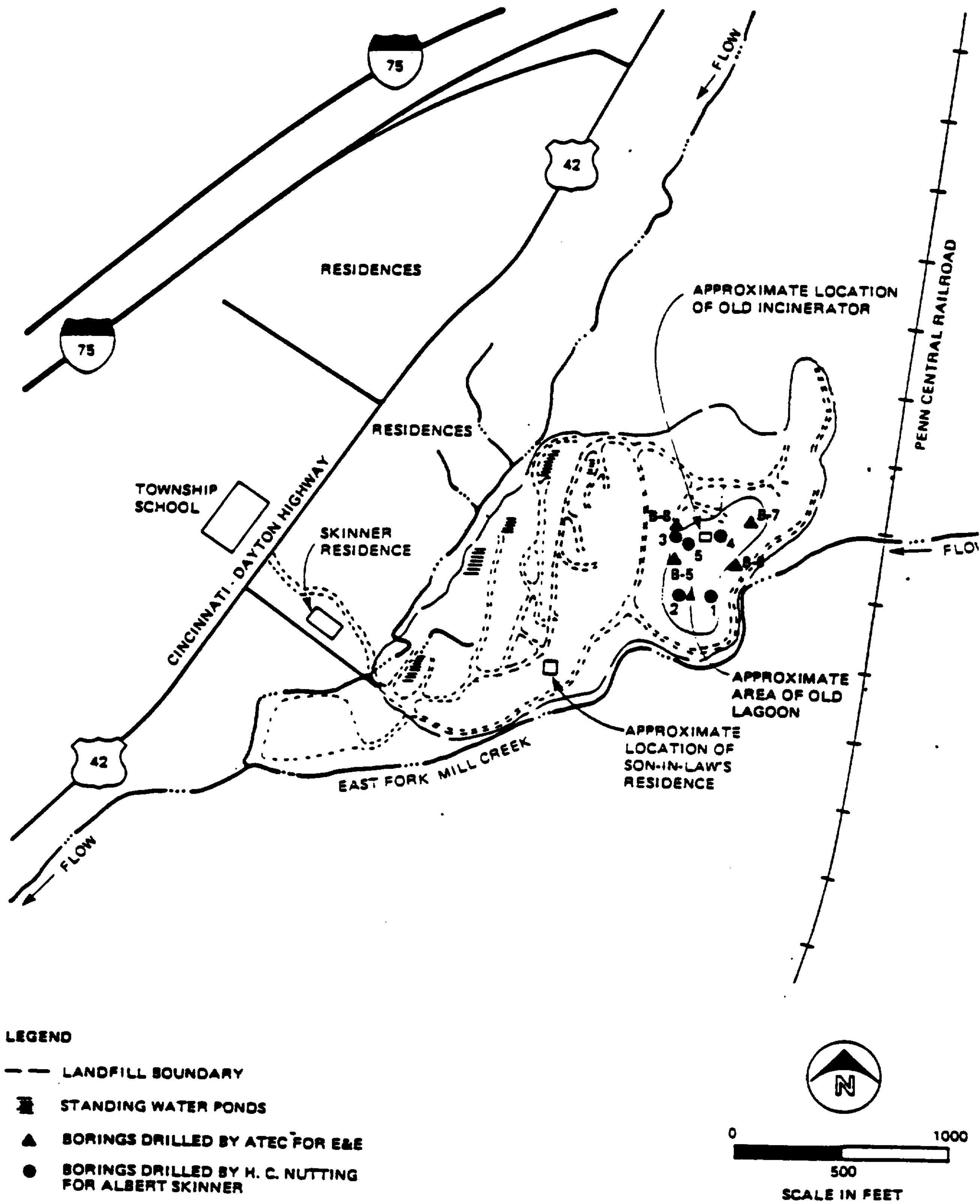

FIGURE 2-5
APPROXIMATE LOCATION OF BORING
DRILLED IN LAGOON AREA
SKINNER LANDFILL

THE H. C. NUTTING COMPAN[Y]
GEOTECHNICAL AND TESTING ENGINEERS SINCE 1
4120 AIRPORT ROAD · CINCINNATI, OHIO 45226 · TEL. 513-321-5[...]

TEST BORING REPORT

CLIENT Albert Skinner ORDER No. 2150.4

PROJECT Skinner Landfill, West Chester, Ohio HOLE No. 1

LOCATION As shown on plan

DRILLER J. Mitchell DRILL No. 33 DATE STARTED 7-29-76

ELEVATION REFERENCE DATE COMPLETED 7-29-76

CASING: DIAMETER 3.25" I.D. Hollow Stem Auger HAMMER WT. FALL

SAMPLER: DIAMETER & TYPE 2.0" O.D. Split Spoon HAMMER WT. 140# FALL 30"

DEPTH TO WATER: IMMEDIATE None UPON COMPLETION None

DEPTH TO WATER DAYS AFTER COMPLETION Backfilled WATER USED IN DRILLING No

ELEVATION	DEPTH 0'	DESCRIPTION OF MATERIALS	SAMPLE No.	SAMPLE DEPTH	TYPE OF SAMPLE	BLOWS PER 6" ON SAMPLER	Recov.
		2.0' Brown and gray silty clay with a trace of organics, moist - stiff to very stiff	1	0-1.5	SS	3-4-6	18"
	2.0'						
		6.0' Brown sandy silty clay and fine to coarse gravel, (limestone pebbles), moist - very stiff	2 3 4	2.5-4 5-6.5 7.5-9	SS SS SS	3-5-9 12-17-19 12-18-16	16" 9" 6"
	8.0'						
		2.0' Brown clayey fine to medium sand and fine to coarse gravel, (limestone pebbles), moist - dense					
	10.0'		5	10-11.5	SS	21-9-8	12"
		2.9' Brown sandy silt with fine to coarse gravel, (limestone pebbles) and clay seams, moist - medium dense	6	12.5-13	SS	23	4"
	12.9'						

[REMAR]KS:

[S]amples recovered from this test boring are available for inspection, which is [s]trongly recommended. The company assumes no responsibility for interpreta[ti]ons made by others of load bearing, stability, excavating or other physical characteristics of materials [encountered].

Respectfully submitted,
THE H. C. NUTTING CO.

PROJECT Skinner Landfill, West Chester, Ohio HOLE No. 1

ELEVATION	DEPTH 12.9'		DESCRIPTION OF MATERIALS	SAMPLE No.	SAMPLE DEPTH	TYPE OF SAMPLE	BLOWS PER 6" ON SAMPLER / or % Core Rec.	Re
		3.6'	Brown fine to coarse sand and gravel, moist - very dense	7 8	13-14 15-16.5	SS SS	50-39 16-25-26	1 1.
	16.5'							
			BORING COMPLETED					

THE H. C. NUTTING COMPAN[Y]

GEOTECHNICAL AND TESTING ENGINEERS SINCE 19[..]

4120 AIRPORT ROAD · CINCINNATI, OHIO 45226 · TEL 513-321-58[..]

TEST BORING REPORT

8/18/76-dn

CLIENT Albert Skinner ORDER No. 2150.4

PROJECT Skinner Landfill, West Chester, Ohio HOLE No. 2

LOCATION As shown on plan

DRILLER B. Ford DRILL No. 32 DATE STARTED 7-29-76

ELEVATION REFERENCE DATE COMPLETED 7-29-76

CASING: DIAMETER 2.25" I.D. Hollow Stem Auger HAMMER WT. FALL

SAMPLER: DIAMETER & TYPE 2.0" O.D. Split Spoon HAMMER WT. 140# FALL 30"

DEPTH TO WATER: IMMEDIATE None UPON COMPLETION None

DEPTH TO WATER DAYS AFTER COMPLETION Backfilled Upon Completion WATER USED IN DRILLING No

ELEVATION	DEPTH	DESCRIPTION OF MATERIALS	SAMPLE No.	SAMPLE DEPTH	TYPE OF SAMPLE	BLOWS PER 6" ON SAMPLER or % Core Rec.	Recovery
	0'	2.5' Brown sandy silty clay with fine gravel and limestone fragments, (fill), moist - soft	1	0-1.5	SS	1-3-3	6"
	2.5'	2.5' Brown and black silty clay with organics, (topsoil and fill), moist - soft	2	2.5-4	SS	3-3-4	13"
	5.0'	2.5' Brown and gray silty clay, (fill), moist - stiff	3	5-6.5	SS	4-5-5	18"
	7.5'	5.0' Brown and gray silty clay with fine to coarse sand and gravel, (odor detected, possible fill), moist - stiff	4 5	7.5-9 10-11.5	SS SS	8-14-15 6-6-6	18" 18"
	12.5'						

REMARKS:

Samples recovered from this test boring are available for inspection, which is strongly recommended. The company assumes no responsibility for interpretations made by others of load bearing, stability, excavating or other physical characteristics of materials penetrated in the boring.

Respectfully submitted,
THE H. C. NUTTING CO.

By

PROJECT Skinner Landfill, West Chester, Ohio HOLE No. 2

ELEVATION	DEPTH 12.5'	DESCRIPTION OF MATERIALS	SAMPLE No.	SAMPLE DEPTH	TYPE OF SAMPLE	BLOWS PER 6" ON SAMPLER / or % Core Rec.	Rec
		2.5' Brown sandy silty clay with fine gravel, (odor detected, possible fill), moist - stiff	6	12.5-14	SS	6-8-10	1[illegible]
	15.0'	1.5' Brown silty fine to medium sand with silt seams and coarse sand, moist - medium dense	7	15-16.5	SS	7-8-13	18
	16.5'						
		BORING COMPLETED					

THE H. C. NUTTING COMPA[NY]
GEOTECHNICAL AND TESTING ENGINEERS — SINCE
4120 AIRPORT ROAD · CINCINNATI, OHIO 45226 · TEL. 513-321-

TEST BORING REPORT

8/18/76-dn

CLIENT: Albert Skinner — ORDER No.: 2150.6

PROJECT: Skinner Landfill, West Chester, Ohio — HOLE No.: 3

LOCATION: As shown on plan

DRILLER: J. Mitchell — DRILL No.: 33 — DATE STARTED: 7-29-76

ELEVATION REFERENCE: — DATE COMPLETED: 7-29-76

CASING: DIAMETER: 3.25" I.D. Hollow Stem Auger — HAMMER WT.: — FALL:

SAMPLER: DIAMETER & TYPE: 2.0" O.D. Split Spoon — HAMMER WT.: 140# — FALL: 30"

DEPTH TO WATER: IMMEDIATE: Wet seam @ 13.5' — UPON COMPLETION: None

DEPTH TO WATER: — DAYS AFTER COMPLETION: Backfilled Upon Completion — WATER USED IN DRILLING: No

ELEVATION	DEPTH 0'		DESCRIPTION OF MATERIALS	SAMPLE No.	SAMPLE DEPTH	TYPE OF SAMPLE	BLOWS PER 6" ON SAMPLER	Re
		5.0'	Brown clayey fine to coarse sand, gravel and limestone fragments, moist - medium dense to dense	1	0-1.5	SS	14-13-11	
				2	2.5-4	SS	29-19-21	
	5.0'			3	5-6.5	SS	25-40-26	
		2.0'	Brown clayey fine to coarse sand, gravel and limestone fragments, moist - very dense					
	7.0'							
		3.0'	Brown fine to coarse sand and gravel, moist - dense	4	7.5-9	SS	15-16-20	
	10.0'			5	10-11.5	SS	10-15-22	
		1.0'	Brown and gray clayey fine to coarse sand and limestone fragments, moist - dense					
	11.0'							

[REM]ARKS:

Samples recovered from this test boring are available for inspection, which is strongly recommended. The company assumes no responsibility for interpretations made by others of load bearing, stability, excavating or other physical characteristics of ...

Respectfully submitted,
THE H. C. NUTTING CO.

PROJECT Skinner Landfill, West Chester, Ohio HOLE No. 3

ELEVATION	DEPTH 11.0'	DESCRIPTION OF MATERIALS	SAMPLE No.	SAMPLE DEPTH	TYPE OF SAMPLE	BLOWS PER 6" ON SAMPLER or % Core Rec.	Re
		1.5' Gray till with gravel, moist - stiff, (driller's break, not enough sample to check).					
	12.5'	1.0' Brown sandy silt and fine to coarse gravel with limestone fragments, moist - medium dense	6	12.5-13.5	SS	7-8	
	13.5'	0.5' Brown clayey fine sand with fine gravel, moist - medium dense	7	13.5-14	SS	10	
	14.0'						
		BORING COMPLETED					

THE H. C. NUTTING COMPANY
GEOTECHNICAL AND TESTING ENGINEERS
SINCE 1
4120 AIRPORT ROAD • CINCINNATI, OHIO 45226 • TEL 513-321-5

TEST BORING REPORT

8/18/76-dn

CLIENT Albert Skinner — ORDER No. 2150.4

PROJECT Skinner Landfill, West Chester, Ohio — HOLE No. 4

LOCATION As shown on plan

DRILLER B. Ford — DRILL No. 32 — DATE STARTED 7-29-76

ELEVATION REFERENCE — DATE COMPLETED 7-29-76

CASING: DIAMETER 2.25" I.D. Hollow Stem Auger — HAMMER WT. — FALL

SAMPLER: DIAMETER & TYPE 2.0" O.D. Split Spoon — HAMMER WT. 140# — FALL 30"

DEPTH TO WATER: IMMEDIATE None — UPON COMPLETION None

DEPTH TO WATER — DAYS AFTER COMPLETION Backfilled Upon Completion — WATER USED IN DRILLING No

ELEVATION	DEPTH	DESCRIPTION OF MATERIALS		SAMPLE No.	SAMPLE DEPTH	TYPE OF SAMPLE	BLOWS PER 6" ON SAMPLER	Reco
	0'	2.5'	Brown silty sandy clay, moist - medium stiff	1	0-1.5	SS	3-4-4	1
	2.5'	2.5'	Brown sandy silty clay with fine to coarse gravel, moist - soft	2	2.5-4	SS	5-9-9	18
	5.0'	2.5'	Brown clayey fine to coarse sand and gravel, moist - medium dense	3	5-6.5	SS	5-5-8	13
	7.5'	2.5'	Brown sandy silty clay with fine gravel and limestone fragments, moist - stiff	4	7.5-9	SS	9-15-17	18
	10.0'	2.5'	Brown fine to coarse sand and gravel with a trace clay, moist - medium dense	5	10-11.5	SS	6-9-11	18'
	12.5'							

REMARKS:

Samples recovered from this test boring are available for inspection, which is strongly recommended. The company assumes no responsibility for interpretations made by others of load bearing, stability, excavating or other physical characteristics of materials ...

Respectfully submitted,
THE H. C. NUTTING CO.

ROJECT Skinner Landfill, West Chester, Ohio HOLE No. 4

ELEVATION	DEPTH 12.5'	DESCRIPTION OF MATERIALS	SAMPLE No.	SAMPLE DEPTH	TYPE OF SAMPLE	BLOWS PER 6" ON SAMPLER
		1.5' Brown sandy silty clay with fine gravel and limestone fragments, moist - medium stiff	6	12.5-14	SS	10-19-23
	14.0'					
		BORING COMPLETED				

THE H. C. NUTTING COMPAN[Y]

GEOTECHNICAL AND TESTING ENGINEERS SINCE 1

4120 AIRPORT ROAD • CINCINNATI, OHIO 45226 • TEL. 513-321-5[...]

TEST BORING REPORT

8/18/76-dn

CLIENT Albert Skinner ORDER No. 2150.4

PROJECT Skinner Landfill, West Chester, Ohio HOLE No. 5

LOCATION As shown on plan

DRILLER J. Mitchell DRILL No. 33 DATE STARTED 7-29-76

ELEVATION REFERENCE DATE COMPLETED 7-29-76

CASING: DIAMETER 3.25" I.D. Hollow Stem Auger HAMMER WT. FALL

SAMPLER: DIAMETER & TYPE 2.0" O.D. Split Spoon HAMMER WT. 140# FALL 30"

DEPTH TO WATER: IMMEDIATE None UPON COMPLETION None

DEPTH TO WATER DAYS AFTER COMPLETION Backfilled Upon Completion WATER USED IN DRILLING No

ELEVATION	DEPTH	DESCRIPTION OF MATERIALS	SAMPLE No.	SAMPLE DEPTH	TYPE OF SAMPLE	BLOWS PER 6" ON SAMPLER	Rec
	0'						
		2.0' Brown sandy silty clay with fine gravel and limestone fragments, moist - medium stiff	1	0-1.5	SS	6-4-5	1
	2.0'						
		2.0' Brown sandy silty clay, moist - stiff to very stiff	2	2.5-4	SS	3-4-6	1
	4.0'						
		1.0' Brown sandy silty clay, moist - stiff, (driller's break, no sample)					
	5.0'		3	5-6.5	SS	8-9-17	[illegible]
		4.0' Brown clayey fine to coarse sand, gravel and limestone fragments, moist - medium dense	4	7.5-9	SS	10-16-11	1[illegible]
	9.0'						
		BORING COMPLETED					

Samples recovered from this test boring are available for inspection, which is strongly recommended. The company assumes no responsibility for interpretations made by others of load bearing, stability, excavating or other physical characteristics of materials penetrated in the boring.

Respectfully submitted,

THE H. C. NUTTING CO.

By [signature]

GENERAL ENFORCEMENT

DRILLING LOG

State Ohio

Site Skinner Landfill

Boring No. B-5

Drilling Firm ATEC

Type of Drill

Driller

Geologist Micheal McCarrin

Start Date

Completion Date July 20, 1982

Ground El.

Groundwater El.
at completion

after ____ days

Total Depth of Boring 16.5'

Elev.	Depth	Description	Blow Count	Sample No.	Remarks
	0	GROUND SURFACE			
	1	Silty Sand, brown	4/7/23	1	damp
	2				
	3	Sandy Silty Clay, brown-tan			
	4		4/6/6	2	moist
	5				
	6		3/5/4	3	moist
	7				
	8				
	9				
	10				

State Ohio

Site Skinner Landfill

Boring No. B-5

Elev.	Depth	Description	Blow Count	Sample No.	Remarks
	11		2/4/5	4	very moist
	12				
	13				
	14				
	15				
	16	Shale, grey End of Boring	7/13/15	5	wet
	17	Well Construction: - Screen set from 12.0 to 15.0 feet - Sand from 11.0 to 15.0 feet - Bentonite from 9.0 to 11.0 feet - Cement grout from 0.0 to 9.0 feet - Well protector casing - 2" PVC well casing - 3'-0.010" PVC screen			

DRILLING LOG

State Ohio

Site Skinner Landfill

Boring No. B-6

Drilling Firm ATEC

Type of Drill

Driller

Geologist Micheal McCarrin

Start Date July 20, 1982

Completion Date July 20, 1982

Ground El.

Groundwater El.
at completion

after ___ days

Total Depth of Boring 19.0'

Elev.	Depth	Description	Blow Count	Sample No.	Remarks
	0	GROUND SURFACE			
	1	Silty Sand, brown, with gravel	10/ 30/24	1	damp
	2				
	3–4		26/ 25/22	2	damp
	5				
	6		19/ 14/17	3	damp
	7				
	8–9	Sandy Silt, brown			
	10				

State Ohio

Site Skinner Landfill

Boring No. B-6

Elev.	Depth	Description	Blow Count	Sample No.	Remarks
	11		16/ 21/22	4	moist
	12				
	13				
	14				
	15				
	16		7/6/8	5	wet
	17				
	18	Sand, grey	8/9/10	6	wet
	19	End of Boring			
		Well Construction: - Screen set from 16.0 to 19.0 feet - Sand from 12.0 to 19.0 feet - Bentonite from 10.0 to 12.0 feet - Cement grout from 0.0 to 9.0 feet - Well protector casing - 2" PVC well casing - 3'-0.010" PVC screen			

DRILLING LOG

State Ohio

Site Skinner Landfill

Boring No. B-7

Drilling Firm ATEC

Type of Drill

Driller

Geologist Micheal McCarrin

Start Date July 20, 1982

Completion Date July 21, 1982

Ground El.

Groundwater El. at completion

after ___ days

Total Depth of Boring 29.0'

Elev.	Depth	Description	Blow Count	Sample No.	Remarks
	0	GROUND SURFACE			
	1	Silty Sand, brown		1	dry
	2				
	3	Clayey Silt, brown		2	damp
	4				
	5				
	6		16/30/15	3	damp
	7				
	8				
	9				
	10				

State Ohio | Boring No. B-7

Site Skinner Landfill | Page 2 of 3

Elev.	Depth	Description	Blow Count	Sample No.	Remarks
	11		17/20/30	4	moist
	12				
	13	Silty Sand, brown with gravel			
	14				
	15				
	16		18/25/29	5	moist
	17				
	18	Silty Sand, grey with gravel			
	19				
	20				
	21		8/10/12	6	wet
	22				
	23				
	24				
	25				
	26		43/40/29	7	wet
	27				
	28	Clayey Till, brown	46/36/54	8	moist
	29	End of Boring			

State Ohio

Boring No. B-7

Site Skinner Landfill

Elev.	Depth	Description	Blow Count	Sample No.	Remarks
		Well Construction: - Screen set from 22.0 to 25.0 feet - Sand from 21.0 to 25.0 feet - Cement grout from 0.0 to 21.0 feet - Well protector casing - 2" PVC well casing - 3'-0.010" PVC screen			

DRILLING LOG

State Ohio

Site Skinner Landfill

Boring No. B-8

Drilling Firm ATEC

Type of Drill

Driller

Geologist Micheal McCarrin

Start Date July 21, 1982

Completion Date July 21, 1982

Ground El.

Groundwater El.
at completion

after ____ days

Total Depth of Boring 19.0'

Elev.	Depth	Description	Blow Count	Sample No.	Remarks
	0	GROUND SURFACE			
	1	Silty Sand, brown	12/15/ 15	1	dry
	2				
	3	Clayey Silt, brown with sand and gravel			
	4		26/20/ 14	2	dry
	5				
	6		16/30/ 15	3	very moist
	7				
	8				
	9				
	10				

State Ohio

Site Skinner Landfill

Boring No. B-8

Elev.	Depth	Description	Blow Count	Sample No.	Remarks
	11		14/19/27	4	moist
	12				
	13				
	14				
	15	Shale, grey			
	16		100 for 5"	5	dry
	17				
	18				
	19	End of Boring	52/100 for 4"	6	dry
	20	Well Construction: - Boring bentonited from 15.0 to 19.0 feet - Screen set from 12.0 to 15.0 feet - Sand from 10.0 to 12.0 feet - Bentonite seal from 8.5 to 10.0 feet - Cement grout from 0.0 to 8.5 feet - Well protector casing - 2" PVC well casing - 3'-0.010" PVC screen			

APPENDIX B

PREVIOUS CHEMICAL DATA

LAGOON SAMPLING CONDUCTED IN 1976

. (No sample location map available)

Results on Laboratory Analysis of Samples Collected

@Skinner Landfill, Union Twp., Butler County

Date of Collection: May 11, 1976

Identification of samples (ODH lab number)

#13750-Liquid in pit (black color)
#13751-Liquid in pit (orange color)
#13752-Barrel recovered from pit
#13753-Barrel recovered from pit
#13754-Barrel recovered from pit

Constituent (All results in mg/l (ppm))	#13750	#13751	#13752	#13753	#13754
Cyanide	6.76	7.5	0.36	5.4	761
Cadmium	755	180	2.0	5.6	50
Chromium(total)	160	65	4.0	350	126
Lead(total)	1050	285	——	1370	554
Mercury(total)	0.047	0.0135	0.006	0.01	0.075
Zinc	480	165	20.0	420	325
Copper	185	129	2.1	269	1840
Phenol	27.3	24	12.8	8.8	11.2

U.S.EPA (Cincinnati lab)

	#13750	#13751
Cyanide	9.1 mg/l	7.7 mg/l

Qualitative determination by gas chromotography-Mass Spectrophotometry process of the constituents in the liquid from Skinner landfill (U.S.EPA Lab-Cincinnati)
Comment: major portion of "ooze" is composed of pesticide intermediat
Compounds: compounds from which pesticides are formulated, and are in their own right toxic.

- Trichloropropane
- Dichlorobenzene
- 1, 3 Hexachlorobutadiene (Aldrin Component)
- Naphthalene (A major Component)
- Hexachlorocyclopentadiene
- Methyl Napthalene (Two Isomers)
- Iso-Butyl Benzolate
- HexachloroNor-Bornadine (Endrin Intermediate)
- Octachloro-cyclo-pentene (The major component, chlordane intermediate)
- Heptachlor-nor-borene (Major component-possibly heptachlor intermediate)
- Hexachlorbenzene (Major Component)
- Chlordene (Chlordane Derivative?)
- Methyl Benzyl Phenone
- Octachlor penta fulvalene

Table 2-2
QUANTITATIVE RESULTS OF LABORATORY ANALYSIS
PIT OOZE AND BARREL LIQUID
SKINNER LANDFILL

Collection Date: May 11, 1976

Constituent (All results in mg/l)	SAMPLE NUMBER #13750	#13751	#13752	#13753	#13754
Cyanide	6.76	7.5	0.36	5.4	761
Cadmium	755	180	2.0	5.6	50
Chromium (total)	160	65	4.0	350	126
Lead (total)	1,050	285	--	1,370	554
Mercury (total)	0.047	0.0135	0.006	0.01	0.075
Zinc	480	165	20.0	420	325
Copper	185	129	2.1	269	1,840
Phenol	27.3	24	12.8	8.8	11.2

The above samples were tested at the U.S. EPA Cincinnati Lab.

	#13750	#13751
Cyanide	9.1	7.7

The sample above was tested at the ODH Lab.

Identification of samples

#13750 - Liquid in pit (black color)
#13751 - Liquid in pit (orange color)
#13752 - Barrel recovered from pit
#13753 - Barrel recovered from pit
#13754 - Barrel recovered from pit

GLI420/7

RECEIVE[illegible]

[illegible]nmental Protection Agen[illegible]

ENVIRONMENTAL MONITORING AND
SUPPORT LABORATORY - CINCINNATI

June 4, 1976

Mr. John E. Richards
Ohio Environmental Protection Agency
Post Office Box 1049
Columbus, Ohio 43216

Dear Mr. Richards:

As requested by telephone on May 19, 1976, we have analyzed the samples delivered to us by Mr. Ken Harsh on May 20. The results of our examinations to this date are:

Sample Identification	Analytical Result
#76-18-#1 Pit Trench	Total cyanide - 9.1 mg/kg (wet weight)
	Organic compounds found and identified:
	trichloropropane
	dichlorobenzene
	1,3-hexachlorobutadiene
	naphthalene - a major component
	hexachlorocyclopentadiene
	methyl naphthalene (2 isomers)
	isobutyl benzoate
	hexachloronorbornadiene
	octachlorocyclopentene - the major component
	heptachloronorbornene - a major component
	hexachlorobenzene - a major component
	chlordene - a major component
	methyl benzophenone
	octachloropentafulvalene
#76-19-#2 Pit Trench	Total cyanide = 7.7 mg/kg
	Organic compounds found and identified:
	trichloropropane
	dichlorobenzene
	1,3-hexachlorobutadiene

naphthalene	- a major component
hexachlorocyclopentadiene	
methyl naphthalene (2 isomers)	
isobutyl benzoate	
hexachloronorbornadiene	
octachlorocyclopentene	- the major component
heptachloronorbornene	- a major component
hexachlorobenzene	- a major component
chlordene	- a major component
methyl benzophenone	
octachloropentafulvalene	
benzoic acid	

The samples are being held under Chain of Custody procedures for further analyses and submission as evidence if required.

Sincerely yours,

Dwight G. Ballinger

Dwight G. Ballinger
Director
Environmentl Monitoring and Support Laboratory - Cincinnati

cc: Dr. Edward Glod, Ohio EPA

TAT SAMPLING CONDUCTED IN 1986

(No sample location map available)

WESTON • SPER River Center, 111 North Canal Street, 8th Floor, Suite 855, Chicago, IL 60606 • (312) 993-1067

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE REMOVAL AND PREVENTION
EPA CONTRACT 68-01-7367

July 20, 1988

TAT-05-G2-00434

Mr. Steven J. Faryan
Deputy Project Officer
Emergency Response Section
Western Response Unit
U.S. Environmental Protection Agency
11th Floor
230 South Dearborn Street
Chicago, Illinois 60604

Reference: Skinner Landfill, Butler County, Ohio
TDD# 5-8702-07

Dear Mr. Faryan:

On January 28, 1986, the U.S. Environmental Protection Agency (U.S. EPA) tasked the Technical Assistance Team (TAT) to conduct a site assessment of the Skinner Landfill in Union Township, Butler County, Ohio. The enclosed site assessment outlines the background of the site, and describes it as observed in January 1986.

As the site is on the National Priorities List and currently being addressed by the U.S. EPA Hazardous Waste Division, Remedial Section, no action by the Emergency Response Section is recommended. However, based on the existing conditions at the site, the following recommendations are presented for referral to the Remedial Section:

- Establishing a ground water monitoring program for wells in and around the landfill.
- Removing and disposing of contaminated soil near Skinner Creek.
- Staging drums from the northeast side of the landfill for sampling, overpacking, and disposal.

Roy F. Weston, Inc.
SPILL PREVENTION & EMERGENCY RESPONSE DIVISION
In Association with ICF Technology Inc., C.C. Johnson & Associates, Inc., Resource Applications, Inc., Geo/Resource Consultants, Inc., and Environmental Toxicology International, Inc.

WESTON·SPER

Should you have any questions or require additional information, please feel free to contact us.

Very truly yours,

ROY F. WESTON, INC.

Sally Matz

For Scott D. Springer
Technical Assistance Team
Leader, Region V

RM/dd
Enclosure

SITE ASSESSMENT

FOR THE

SKINNER LANDFILL
UNION TOWNSHIP
BUTLER COUNTY, OHIO

Prepared For:

U.S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois

CONTRACT NO. 68-01-7367

TDD# 5-8702-07

TAT-05-G2-00434

Prepared By:

WESTON-SPER
Technical Assistance Team
Region V

July 1988

TABLES OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 SITE DESCRIPTION

The property utilized by Operating Industries Inc., commonly known as Skinner Landfill, is a demolition debris landfill. Past practices of the landfill involved acceptance of pesticide waste, chemical waste, liquid industrial waste and, allegedly, military chemical ordinance. The landfill is located in Butler County, Ohio, approximately one-half mile northeast of the Town of West Chester, and approximately one-half mile south of the interchange between Interstate 75 and Cincinnati-Dayton Road in Union Township, Ohio, Range 3, Township 2, Section 22 (Figure 1). The Skinner property comprises approximately 78 acres of hilly terrain. The property is bordered on the north and east by wooded land, and on the south by both wooded and agricultural land. To the west is Cincinnati-Dayton Road with an elementary school located across from the Skinner property. The U.S. Environmental Protection Agency (U.S. EPA) Remedial Investigation Feasibility Study (RI/FS) report of the Skinner Landfill states:

> "The site is situated in a highly dissected area that slopes from a till-mantled, bedrock upland at elevations of 850 to 900 feet (M.S.L.) to a broad, flat-bottomed valley, which is occupied by Mill Creek, at elevations of 600 to 650 feet. Elevations within the Skinner property range from 650 to 750 feet. The property is traversed by two intermittent streams, one of which, East Fork, flows approximately west to east through the southern part of the site. The other stream, known as Skinner Creek, flows southwesterly, parallel to and about 600 feet east of Cincinnati-Dayton Road. In the angle between the two streams is an upland, having two en-echelon, elongated hills, which are also oriented roughly parallel to Cincinnati-Dayton Road. Several ponds are present on the western flank of the western hill, which shows evidence of sand and gravel extraction.
>
> In general, the site is underlain by relatively thin glacial drift (less than 35 feet) over interbedded shales and limestones of Ordovician age. Based on water well logs and boring logs from the limited on-site investigations, the soils are mixtures of sand, silt and clay in varying proportions. The soil stratigraphy is not well-defined. There appears to be a narrow buried valley that branches off from the Mill Creek buried valley towards West Chester. Drift thicknesses of up to 100 feet were found in West Chester, where a substantial layer of sand and gravel contain an aquifer which serves as a water supply for many residences. This buried valley may extend into the Skinner property at its southeastern corner in the vicinity of the

confluence of the two streams. Preliminary hydrogeologic evaluations by St. John (1981) and Hosler (1976) concluded that ground water flow in the vicinity of the site was most likely in a southwesterly direction, toward the buried valley. However, the depth and configuration of the water table are not well-defined."

2.0 SITE BACKGROUND

The Skinner property first became involved in landfilling in 1934. John R. Kennedy, sanitarian for the Butler County Health Department, states in a 1959 letter that the landfill was used for disposal of general trash from a paper plant, other materials used in the paper making process, and scrap metal from various sources. This letter was written in response to a complaint about late night burning and irritating smoke coming from the Skinner property.

On April 2, 1963, Operating Industries, Inc., requested permission from the Butler County Board of Health (BCBH) to conduct a sanitary landfill operation on the Skinner property in Union Township. The principals of Operating Industries, Inc., included Albert Skinner, Skinner Sand and Gravel Company, and George Solomon of Cincinnati, Ohio. The BCBH approved the use of the site as a sanitary landfill.

The Dalewood Homeowners Association (DHA) opposed the landfill, and subsequently stated their case to the BCBH. On June 25, 1963, the DHA wrote the BCBH, which stated that Skinner Landfill was accepting "liquid cyanide waste" from the Sharonville Ford Motor Company Plant. The DHA further alleged that chemical wastes from Andrew Jurgens Company, Dow Chemical Company, Globe Valve Company, and Cincinnati Chemical Company were being disposed of in Skinner Landfill. In a letter dated June 23, 1964, the Ford Motor Company confirmed that materials containing cyanide were disposed in the Skinner Landfill. No actions were taken regarding these complaints, and the landfill continued operations.

The Southwestern Ohio Air Pollution Control (SOAPC) received a complaint from a citizen on April 19, 1976, concerning heavy smoke and odors emanating from the Skinner Landfill during the period of April 8, 1976, to April 19, 1976. The citizen also reported experiencing eye irritation on April 16, 1976. This same citizen reported seeing two tank trucks enter and leave the landfill. SOAPC inspector Hugh Davis investigated the complaint and reported that the cause of the latest observed fire (April 18, 1976) was the burning of old tires and scrap lumber at the facility. He stated in his report that he could not discern any chemical odor. One fireman reported that they feared the fire would reach a nearby lagoon containing a black, oily liquid. The surface area of the lagoon was estimated to be approximately 35 feet x 40 feet.

On April 21, 1976, the Ohio Environmental Protection Agency (OEPA) was asked to investigate the latest suspicion of whether waste from the Chem-Dyne Corporation Industrial Waste Storage Plant was being delivered to the Skinner Landfill. The Chem-Dyne Corporation denied that any of their waste was disposed of at the Skinner Landfill site.

After access had been denied on April 22, representatives of OEPA, SOAPC, BCHD, and Butler County Sheriff's Deputies entered the Skinner Landfill on April 26, 1976, with a search warrant. The area of the lagoon noted during the April 18, 1976 fire had been recently graded. This grading allegedly began the afternoon of April 22, 1976, after access was denied. Over one hundred 55-gallon drums marked "Chemical Waste" were also observed during the April 26 inspection.

The OEPA received reports on May 3, 1976, that the Skinners had been trucking unknown materials off their property late at night. The trucks left the landfill with their lights off, and consequently, were not readily identifiable.

On May 4, 1976, representatives of OEPA and the Butler County Sheriff's Department returned to the Skinner Landfill site with a search warrant to conduct further investigations. The inspector found the road leading to the regarded lagoon area blocked by a bulldozer, that the Skinners claimed was inoperable. When the Skinners were told that the OEPA would return with the equipment to move the bulldozer they stated that the following materials were buried at the landfill: nerve gas; mustard gas; incendiary bombs; phosphorous; Flame Throwers; cyanide ash; and explosive devices.

At this time the OEPA withdrew from the site, and inquiries were made into the Skinner's allegations. Sources confirmed only that that cyanide ash, phosphorous, and one or two flame throwers with canisters had been disposed of by the Skinners. No confirmation was available of the other materials claimed to be disposed of on the site. Due to the possible involvement of weaponry, the Pentagon was contacted and a specialized unit was secured to aid in the site investigation.

At a meeting on May 10, 1976, between the Butler County Sheriff, U.S. EPA, and the U.S. Army Special Unit, the Sheriff stated that the Skinners' had been working all Saturday night, Sunday and Sunday night moving earth. Representatives of the OEPA, U.S. Army Special Unit, and Butler County Sheriff's Department entered the Skinner Landfill on May 11, 1976, and proceeded to the lagoon area that had been pinpointed on aerial photographs. As excavation of the lagoon area was undertaken, a chemical odor became stronger, and individuals in the general area reported experiencing burning eyes and general discomfort. At a depth of 10 feet, the soil removed became black, slimy and moist. At 15 feet, thick black liquid began flowing into the excavated trench. Between 15 to 20 feet, a layer of 55-gallon drums was discovered, as well as red and green material resembling paint. Seven samples were collected from the excavated site and drums. Consultants from Chem-Dyne had stated earlier that there might have been a clay and/or vinyl liner in the lagoon area. No liner was encountered during the excavation.

Analysis of the May 11, 1976, OEPA sampling of pit ooze and drum liquid indicated the presence of several pesticide intermediate compounds as well as cyanide, cadmium, chromium, lead, mercury, zinc, copper and phenol. Despite these findings, the landfill continued operations.

On July 22, 1977, J. Zorn, of Rayan Engineering, took aerial slides of the Skinner Landfill and reported open burning in the disposal site area. The OEPA reinvestigated the Skinner Landfill on July 25, 1977, and made the following observations: demolition type waste and earth had been dumped in the OEPA authorized excavation of May 11, 1976; a pile of unknown white bulk material had been dumped recently; a leachate was noted seeping from near the buried lagoon area; and drums were stacked near the creek which runs through the landfill. The drums were filled with a white colored semisolid. Several drums were leaking and had drained into a nearby creek; Mr. Skinner stated that the material was used for dust control on his driveways.

Legal proceedings were initiated by the State of Ohio, against the Skinner Landfill operation, in the Butler County Court of Common Pleas (CCP) on August 22, 1977. In January of 1979, the CCP entered a final judgment, denying the Skinners any further chemical waste disposal at their landfill. The Court refused, however, to issue a mandatory injunction directing the Skinners to remove the accumulated wastes present on the site.

On August 1, 1979, the Butler County Court of Appeals affirmed the CCP judgment of January 1979, refusing to issue the mandatory injunction to remove present wastes on site. Twelve days later, on August 13, 1979, the OEPA requested that the Attorney General's Office appeal the Court of Appeals, First Appellate District of Ohio, decision in State of Ohio, ex rel. Ned E. Williams, et al., versus Albert Skinner and Mrs. Albert Skinner, dba The Skinner Landfill, No. CA79-02-0010, filed August 1, 1979. OEPA lost this appeal.

The Field Investigation Team (FIT) on September 10, 1980, attempted a site inspection, but were refused entrance by Mrs.

Skinner. On July 19, 1982, the FIT finally gained access and began drilling four monitoring wells as part of the Mitre Program (Hazardous Ranking System). The four monitoring wells were completed on July 22, 1982. Two of the wells were dry, and the other two were sampled on July 27, 1982. The FIT submitted their assessment to the U.S. EPA on September 3, 1982.

In April 1983, the U.S. EPA conducted a responsible party search of the Skinner Landfill. The Remedial (REM II) activities for Skinner Landfill undertaken by Roy F. Weston Inc., began in August 1984. On January 28, 1986, U.S. EPA Remedial Project Manager (RPM) Gene Wong, requested that the U.S. EPA Emergency Response Section perform a site assessment of the Skinner Landfill.

3.0 SITE INSPECTION

On February 13, 1986, On-Scene Coordinator (OSC) Ross Powers, and Technical Assistance Team (TAT) members Robert McLeod and Craig Bell met with RPM Gene Wong, OEPA representative Tom Onco, and Mark Hudson and Mike Bort of Roy F. Weston, (REM II project). Additionally, Mr. Skinner's son, Ray Skinner was present as an escort. TAT members air monitored the site with a photoionization detector (HNU) and a combustible gas indicator. Only the HNU readings exceeded background, which occurred during near contact with suspect material.

During the site inspection, it was noted that active demolition waste landfilling was occurring throughout the 78 acres of the Skinner Landfill. The site, well vegetated with mature trees, had four active residences within its confines (Figure 2). Partial fencing encompassed the site, however the landfill was easily accessible with off-road recreational vehicles entering the site often. Numerous underground storage tanks, junk vehicles, appliances, railroad cars, and demolition debris littered the site. The Skinners also have several pieces of heavy equipment, a rock crushing device, several storage buildings and an abandoned stacked burning pit on the site.

Supposedly, numerous drums on the site contained motor oil, grease and anti-freeze, which are used in the operation of heavy equipment. One group of drums, near Skinner Creek on the west side of the site, consisted of thirty-three 55-gallon drums marked "paint thinner", and sixty-three 5-gallon cans marked "roofing tar". These drums were in deteriorated condition, and several had degraded to the point of losing their contents. The other large collection of drums was at the north boundary in a heavily vegetated area. Here, approximately fifty 55-gallon drums were situated in a disorderly manner. Several of these drums were severely degraded and the contents solidified. These drums appeared to contain paint. All other drums and tanks on the site, which contained materials, were identified by Mr. Ray Skinner to contain motor oils, grease and anti-freeze all used in the operation of the landfill.

Mr. Ray Skinner reported that he intended to move all the drummed material used in the landfill operation into locked railroad cars. Mr. Ray Skinner also stated that he intended to sell the tar and thinner located by Skinner Creek, and crush every empty steel drum on the landfill. The several large underground storage tanks present on the site were part of a scrap metal operation engaged in by Mr. Ray Skinner, and were open and appeared empty.

The site of both the buried lagoon and excavation of May 11, 1976, was heavily vegetated and partially covered by demolition debris. The four monitoring wells at the old lagoon site appeared to be in good condition. One empty electrical transformer was observed at the site.

On February 14, 1986, TAT members Bell and McLeod met OSC Powers and RPM Wong, at the Skinner Landfill to conclude the site inspection. Mr. Ray Skinner again accompanied the group during the inspection. The morning activities consisted of continuing to locate and identify drums and their contents. The drums located that day were either empty, or identified by Mr. Ray Skinner as containing material used in the operation of the landfill. At the end of the day, it was decided that a comprehensive sampling of the site would be carried out to characterize the site.

On February 19, 1986, TAT members Bell and McLeod met OSC Powers at Skinner Landfill. Mrs. Skinner refused entry, stating that her son was not available to escort the team. OSC Powers contacted the office of Regional Counsel who worked out an agreement to allow entry on February 20, 1986.

On February 20, 1986, TAT members Bell and McLeod, along with OSC Powers entered Skinner Landfill to collect samples. Mr. Ray Skinner accompanied the sampling team throughout the day.

Samples were collected to qualify potential surface problems, which included a pile of white material, drums on site, flooring blocks and a transformer. Additionally, sampling was used to identify off-site migration of contaminants. The areas identified as potential release points included seeps below the old waste lagoon, seeps below the landfilling operation, runoff from the landfill, and runoff from the old waste lagoon.

The first phase of the sampling involved bailing the monitoring wells and placing seep collectors in the stream bank. Upon completion of the aforementioned tasks, the pile of white material identified as lime was sampled by pushing a hollow tube three feet into the material. The tube was then extracted and the cores of the samples composited. The sample was analyzed for metals, organics, ignitibility and reactivity.

Along Skinner Creek, the thirty-three 55-gallon drums marked "thinner", and sixty-three 5-gallon cans marked "roofing tar" had been removed by the property owner prior to the February 20 visit. A composite soil sample was collected from the spot were the drums had been placed. This sample was analyzed for volatile organic compounds (VOCs).

Of approximately fifty 55-gallon drums located on the north boundary of the landfill, a single drum was sampled. This sample was analyzed for VOCs and flashpoint. Open drums showed decay, and appeared to contain similar substances - i.e., paint.

A pile of flooring blocks on the site were sampled by breaking up several of the blocks and compositing the pieces. The samples were analyzed for polychlorinated biphenyls (PCBs). A composite soil sample was collected from around the base of an apparently empty transformer, and analyzed for PCBs.

To identify off-site contaminant migration, these samples were analyzed for metals and organics.

Two monitoring wells, situated at the site in the now buried lagoon, were sampled with a stainless bailer. The bailer was decontaminated between wells and the cord changed. The well samples were analyzed for metals and organics.

On March 14, 1986, TAT members Bell and McLeod returned to the Skinner Landfill, and sampled the four wells on the property. The wells were all potable water sources utilized by the Skinner family. The samples were analyzed for VOCs.

4.0 ANALYTICAL RESULTS

Analytical results are presented in the following: Table 1 from the February 20, 1986 liquid sampling, Table 2 from the February 20, 1986 well sampling, and Table 3 from the March 14, 1986 well sampling. Table 4 presents the list of compounds and elements detected at the Skinner Landfill with the associated referenced standards.

As illustrated in the three tables, many compounds and elements exceed the regulatory standards. The majority of these contaminants are Resource Conservation and Recovery Act (RCRA) regulated waste and therefore, are listed hazardous waste.

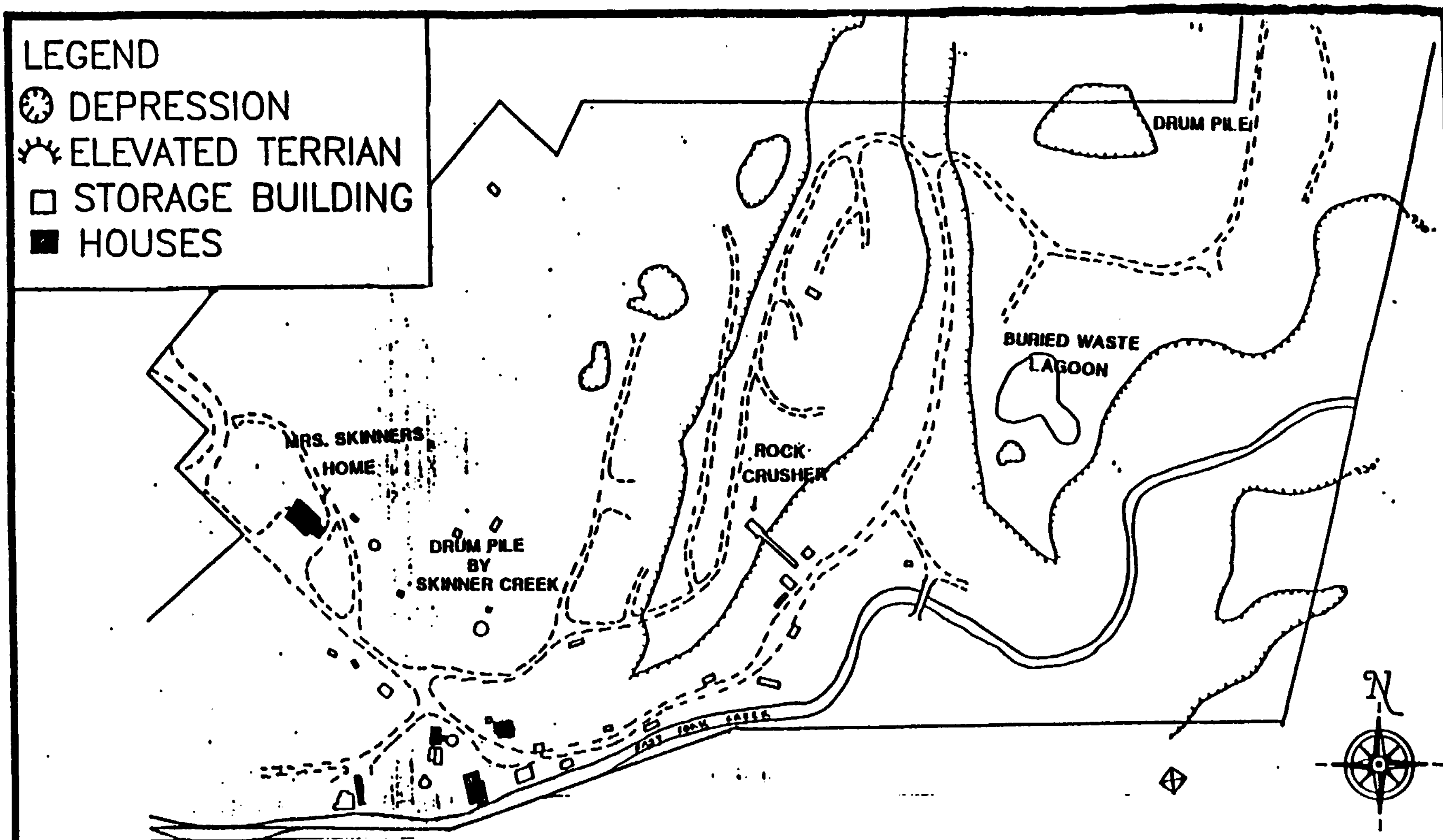

FIGURE 2
SITE MAP
SKINNER LANDFILL
WESTCHESTER, OHIO

NOT TO SCALE

WESTON
MANAGERS DESIGNERS/CONSULTANTS

DRAWN BY L.A.	DATE 6-9-88	PCS # 1194
APPROVED J.B.	DATE 6-9-88	TDD # 5870207

TABLE 1
ANALYTICAL RESULTS OF SAMPLES COLLECTED BY THE TAT*
AT SKINNER LANDFILL
WEST CHESTER, OHIO
FEBRUARY 20, 1986
(results in parts per billion)

CONTAMINANT	LAGOON SEEP #50	LAGOON RUNOFF #53	DUMP SEEP #51	DUMP RUNOFF #52	LIME LAGOON #1	NORTH EAST DRUM PILE #2	SOIL BY SKINNER CREEK #3
BENZENE	—	—	—	—	NA	15.07**	—
2-CHLOROETHYLVINYL ETHER	39.48	42.90	45.77	22.32	NA	—	3580.08
CHLOROFORM	3.67	—	4.84	2.19	NA	—	294.73
TRANS-1,3-DICHLOROPROPANE	—	—	—	—	NA	—	4.61
ETHYL BENZENE	—	3.76	—	—	NA	3403.50**	11.39**
METHYLENE CHLORIDE	37.01	12.51	82.52	54.67	NA	—	—
TOLUENE	40.41	125.82	59.17	77.22	NA	3803.80**	—
1,1,1-TRICHLOROETHANE	39.19	52.15	31.85	33.79	NA	—	—
TRICHLOROETHENE	—	54.88	—	—	NA	—	—
ANTHRACENE	—	—	—	1.13	NA	NA	NA
PHENANTHRENE	—	—	—	1.18	NA	NA	NA
EP Toxicity (results in ppm)							
ARSENIC	0.12**	—	0.007**	0.006**	0.001**	NA	NA
BARIUM	—	—	—	—	3.0**	NA	NA
CHROM-TOTAL	0.33	—	0.13	—	—	NA	NA
COPPER	0.11	—	—	—	NA	NA	NA
LEAD	0.28	—	—	—	—	NA	NA
MERCURY	0.19	—	—	—	—	NA	NA
NICKEL	0.20	—	—	—	NA	NA	NA
ZINC	0.88	—	—	—	NA	—	NA
FLASH POINT	NA	NA	NA	NA	>212°F	82°F	NA

*Samples Analyzed by Suburban Laboratories, Inc., Hillside, Illinois
— Below Detection Limit
NA Not Analyzed
** Concentrations reported in parts per million

TABLE 2
ANALYTICAL RESULTS OF SAMPLES COLLECTED BY THE TAT*
AT SKINNER LANDFILL
WESTCHESTER, OHIO
FEBRUARY 20, 1986
(results in parts per billion)

CONTAMINANT	WELL #54	WELL #55D	WELL #56	FIELD BLANK
BENZENE	1163.39	1270.37	8.66	-
CHLOROBENZENE	62.49	75.46	-	-
CHLOROETHANE	288.61	343.38	-	-
CHLOROFORM	59.36	70.21	122.37	5.93
1,3 DICHLOROBENZENE	756.24	586.48	-	-
1,4 DICHLOROBENZENE	111.11	-	-	-
1,1 DICHLOROETHANE	1780.31	1963.23	-	-
1,2 DICHLOROETHANE	65.48	101.84	-	-
1,1 DICHLOROETHENE	20.43	35.66	22.97	-
TRANS 1,2 DICHLOROETHENE	788.32	968.22	-	-
1,2 DICHLOROPROPANE	805.54	1376.18	-	-
ETHYL BENZENE	181.40	215.82	7.30	-
METHYLENE CHLORIDE	295.06	516.79	1104.69	36.22
TOLUENE	3231.65	3393.95	381.62	44.79
1,1,1 TRICHLOROETHANE	176.75	274.89	293.65	24.06
TRICHLOROETHENE	25.01	14.73	29.02	-
PHENOL	14.10	-	-	-
2-CHLOROPHENOL	6.27	-	-	-
BIS (2-CHLOROETHYL) ETHER	315.61	313.18	-	-
BIS (2-ETHYHEXYL) PHTHALATE	32.34	61.78	4.68	1.10
NAPHTHALENE	12.38	16.25	-	-
ARSENIC	20.00	30.00	NA	-
ZINC	230.00	180.00	NA	-

* SAMPLES ANALYZED BY SUBURBAN LABORATORIES, INC, HILLSIDE, ILLINOIS
- Below Detection Limit
NA Not Analyzed

TABLE 3
ANALYTICAL RESULTS OF SAMPLES COLLECTED BY THE TAT*
AT SKINNER LANDFILL
WEST CHESTER, OHIO
March 14, 1986
(results in parts per billion)

CONTAMINANT	S61 LAGOON WELL	S62 SKINNER WELL	S64 FIELD BLANK
1,1 DICHLOROETHANE	3.00	—	—
1,2 DICHLOROPROPANE	5.00	—	—
1,1,1 TRICHLOROETHANE	20.00	14.00	—

* SAMPLES ANALYZED BY CANTON ANALYTICAL LABORATORY, INC, YPSILANTI, MICHIGAN
— Below Detection Limit

TABLE 4
STANDARDS FOR CONTAMINANTS
FOUND AT SKINNER LANDFILL
(Concentrations in parts per billion)

CONTAMINANT	TLV/1	AQUATIC CRITERIA/2	HA ONE DAY/3	HA TEN DAYS/3	HA CHRONIC/3	CONC. IN NATURAL SOILS/4
BENZENE	30	5300	-	230	70	-
CHLOROBENZENE	350	3500	1800	1800	30000	-
CHLOROFORM	10000	1200	-	-	-	-
1,3 DICHLOROBENZENE	-	700	-	-	-	-
1,4 DICHLOROBENZENE	-	440	-	-	-	-
1,1 DICHLOROETHANE	-	-	-	-	-	-
1,2 DICHLOROETHANE	-	-	-	-	-	-
1,1 DICHLOROETHENE	-	-	1000	-	70	-
TRANS 1,2 DICHLOROETHENE	-	-	2700	270	-	-
1,2 DICHLOROPROPANE	-	2100	-	90	-	-
ETHYL BENZENE	435	560	-	-	-	-
METHYLENE CHLORIDE	350	-	13000	1500	150	-
TOLUENE	375	5200	21500	2200	340	-
1,1,1 TRICHLOROETHANE	-	-	-	-	1000	-
TRICHLOROETHENE	-	-	2000	200	75	-
PHENOL	19	3400	-	-	-	-
2-CHLOROPHENOL	-	180	-	-	-	-
NAPHTHALENE	50	-	-	-	-	-
ARSENIC	0.20	440	-	-	-	5000
BARIUM	-	-	-	-	-	430000
CHROM-TOTAL	-	21	1400	1400	-	100000
COPPER	0.20	-	-	-	-	30000
LEAD	-	-	-	-	-	10000
MERCURY	0.05	4.1	-	-	-	30
NICKEL	-	-	-	-	-	40000
ZINC	5.00	-	-	-	-	50000

1. Threshold Limit values established by the American Conference of Governmental Industrial Hygienists.

2. Federal Water Quality Criteria for Freshwater Aquatic Life (Acute).

3. Health Advisories (1-day, 10-day, chronic) established by the U.S. EPA Office of Drinking Water.

4. Average Element Concentrations in Natural soils adapted from Hazardous Waste Land Treatment, U.S. EPA, SW-874 (April, 1983).

5.0 THREATS TO HUMAN HEALTH AND THE ENVIRONMENT AS RELATED TO THE NATIONAL CONTINGENCY PLAN

The Skinner Landfill site has been found to pose the following actual and potential threats to human health and the environment as delineated in 40 CFR Section 300.65 (b)(2) of the National Contingency Plan:

1) Actual or potential exposure to hazardous substances, pollutants or contaminants by nearby populations, animals or the food chain;

2) Actual or potential contamination of drinking water supplies or sensitive ecosystems;

3) Hazardous substances or pollutants or contaminants in drums, barrels, tanks or bulk storage containers that may pose a threat of release to the environment; and

4) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate.

5.1 Actual or Potential Exposure

The presence of the drums at the northeast corner of the site poses an existing threat of exposure. These drums, tentatively identified as "brilliantly colored paint", are randomly scattered, in various stages of decay, and currently leaking contents. Sample analysis indicates that these drums contain high concentrations of benzene, ethyl benzene and toluene. The status and condition of these drums presents an actual and potential threat to nearby populations, animals, and the food chain.

5.2 Actual or Potential Contamination

The sample data generated from the monitoring wells in the buried waste lagoon demonstrates the presence of elevated levels of chloroform, 1,3-dichlorobenzene, methylene chloride, toluene and 1,1,1-trichloroethane (1,1,1-TCA) in the ground water. However, analysis of water samples collected from the potable water wells on site show only three contaminants: 1,1-dichloroethane, 1,2-dichloropropane and 1,1,1,-TCA. These substances were present at levels not considered hazardous. The potential contamination of drinking water supplies does exist through migration of the contaminants in to the ground water, and may explain the presence of 1,1,1-TCA in both the monitoring wells and the potable water wells.

5.3 Threat of Release

In its current state, the drum pile at the northeast corner of the site has released contaminants, and poses a continuing threat of release as the drums decompose.

5.4 Threat of Migration

Surface soils collected next to Skinner Creek (where drums marked "thinner" had been stored) were analyzed, with results showing elevated levels of ethyl benzene and chloroform. The proximity of Skinner Creek to the contaminated surface soils offers a path of migration for contaminants.

6.0 RECOMMENDATIONS

Because Skinner Landfill is on the National Priorities List, and currently under investigation by the U.S. EPA Waste Management Division, Remedial Section, action by the Emergency Response Section is not warranted at this time. Based on the above threats, the TAT does recommend the following for implementation by the lead agency:

- establish a monitoring well sampling program in and around the landfill;
- remove contaminated soils for disposal or treatment; and,
- stage, sample, overpack, and dispose of drums located in the northeast section of the site.

ROUND 1 AND 2 RI/FS SAMPLING

CONDUCTED IN 1986

APPENDIX F

SAMPLING DATA TABLES

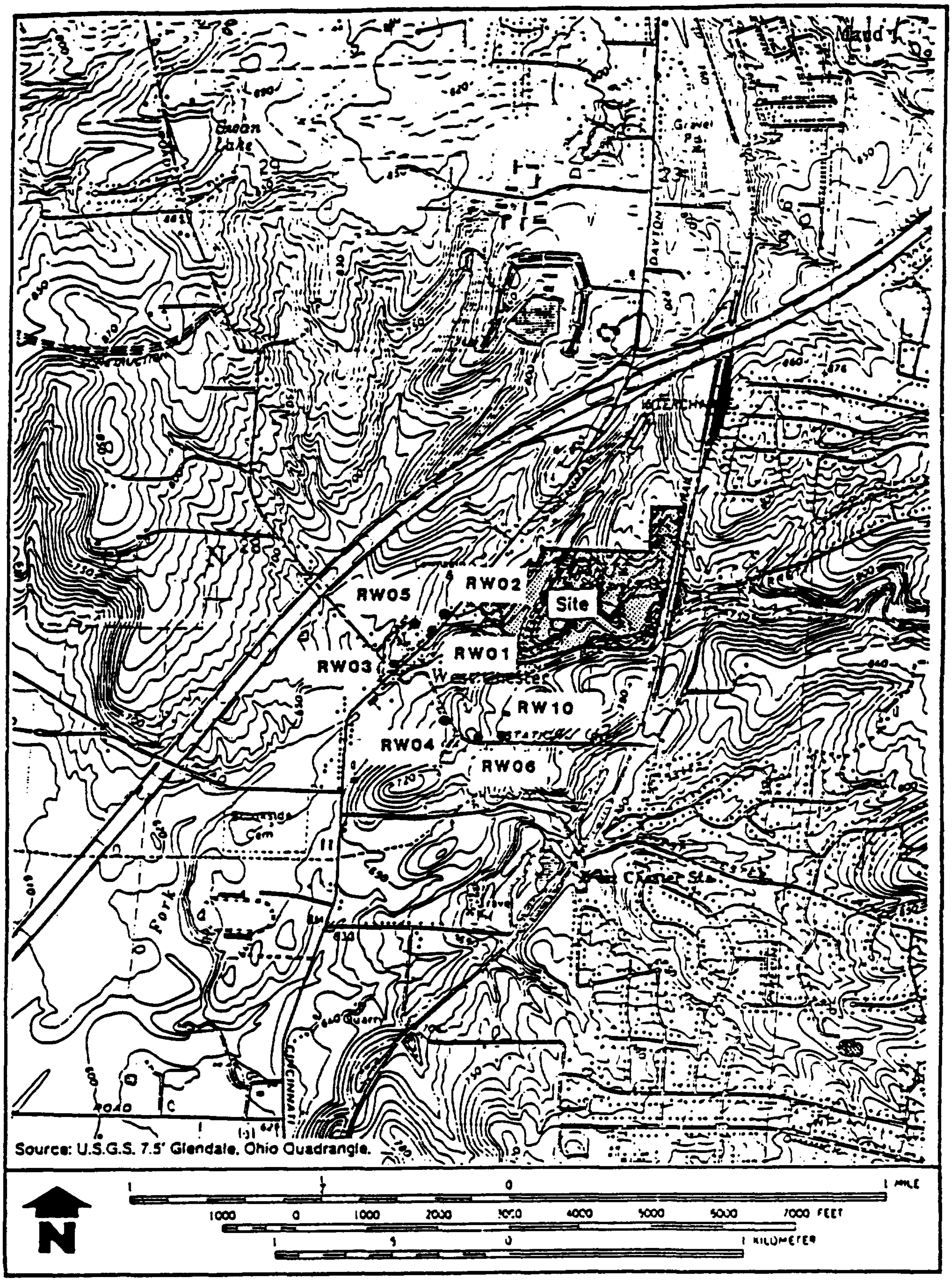

FIGURE 5-5 RESIDENTIAL WELL SAMPLING LOCATIONS

TABLE 5-12

SUMMARY OF RESIDENTIAL WELL VOC ANALYSES
ALL VALUES IN ug/l (ppb)

	RW01	RW02	RW03	RW04	RW05	RW05DP	RW06	RW10	Field Blank	Maximum Contaminant Level (MCL)
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	9.0	200
Acetone	---	---	---	---	---	---	---	---	77	NE
Bromodichloromethane	---	---	5.0	---	---	---	---	---	---	100
Chloroform	---	---	8.0	---	---	---	---	---	---	100
Toluene	---	---	---	---	---	---	---	5.5	---	2000*
Methylene Chloride	---	---	---	---	---	---	---	10.0	---	NE

--- Not Detected
DP - Duplicate
NE - Not Established
* Recommended Maximum Contaminant Level (RMCL)

TABLE 5-13

SUMMARY OF RESIDENTIAL WELL BNA ANALYSES
ALL VALUES IN ug/l (ppb)

	RW01	RW02	RW03	RW04	RW05	RW05DP	RW06	RW10	Field Blank	Maximum Contaminant Level (MCL)
Fluoranthene	---	2.0	---	---	---	---	---	---	---	NE
Pyrene	---	1.7	---	---	---	---	---	---	---	NE
Phenol	---	---	---	---	---	---	---	140	---	NE
4-Methylphenol	---	---	---	---	---	---	---	210	---	NE
Benzoic Acid	---	---	---	---	---	---	---	45	---	NE

--- Not Detected
DP - Duplicate
NE - Not Established

TABLE 5-14

SUMMARY OF RESIDENTIAL WELL PESTICIDE/PCB ANALYSES
ALL VALUES IN ug/l (ppb)

	RW01	RW02	RW03	RW04	RW05	RW05DP	RW06	RW10	Field Blank	Maximum Contaminant Level (MCL)
Lindane	---	---	---	---	---	---	0.060	---	---	NE
Heptachlor	---	---	---	---	---	---	0.060	---	---	0*
Heptachlorepoxide	---	---	0.060	0.060	0.060	0.060	---	---	---	0*
Endosulfan I	---	0.067	0.040	0.040	0.040	0.040	0.20	---	---	NE
Dieldrin	---	0.690	---	---	---	---	0.240	---	---	NE
Beta-BHC	---	---	---	---	---	---	---	10.5	---	NE
Delta-BHC	---	---	---	---	---	---	---	5.8	---	NE
4,4-DDT	---	---	---	---	0.060	0.090	0.460	---	---	NE
Methoxychlor	---	---	---	---	---	---	0.520	---	---	NE
Aroclor 1245	---	---	---	---	0.20	0.20	---	---	---	0*

--- Not Detected
DP - Duplicate
* Proposed Value

TABLE 5-15

SUMMARY OF RESIDENTIAL WELL INORGANICS ANALYSES
SKINNER LANDFILL
ALL VALUES IN ug/l (ppb)

	RW01-01	RW02-01	RW03-01	RW04-01	RW05-01	RW05-DP	RW06-01	RW10-01	Field Blank	Primary Drinking Water Standards
Aluminum	---	98.2 K	---	---	92.6	88.3	45 K	2650	---	NE
Barium	50	633	48.0	50.4	120	118	592	184	---	1000
Boron	206	155	132	93.6	574	258	94.3	127	---	NE
Calcium	97.3 K	219 K	77.7 K	99.5 K	97.7 K	97.4 K	155 K	151 K	---	NE
Chromium	---	186	---	---	---	---	76.4	10.2	9.45 K	50
Copper	---	466	37.7	10.5	7.49	7.43	157	38.7	---	1000*
Iron	---	160 K	165	233	335	347	91.7 K	19.5 K	---	300*
Lithium	26.0	150	---	12.5	46.4	46.5	54.8	18.9	---	NE
Magnesium	27.0 K	58 K	11.6 K	---	26.8 K	26.7 K	33.6 K	29.2 K	---	NE
Manganese	31.8	2390	29.0	65.8	298	299	4020	667	---	50*
Potassium	---	14.9 K	3.04 K	---	---	---	6.14 K	62.7 K	---	NE
Sodium	18.0 K	4.96 K	11.5 K	---	148.0 K	148 K	3.12 K	11.4 K	---	NE
Strontium	1620	504	209	322	1340	1340	325	340	---	NE
Zinc	103	4910	298	858	894	887	1410	412	---	5000*
Alkalinity as CaCO3 (mg/l)	284	116	169	239	250	257	268	537	---	NE
Chloride (mg/l)	39	---	3	11	310	310	---	20	---	250*
Nitrate as Nitrogen (mg/l)	0.25	4.02	4.35	0.41	0.63	0.63	1.54	---	---	10
Sulfate (mg/l)	84	32	28	60	37	37	47	28	---	250*
Ammonia (mg/l)	---	---	---	---	---	---	---	---	---	NE

--- Not Detected
DP - Duplicate
* - Secondary drinking water standard.
K = Multiply Result by 1000

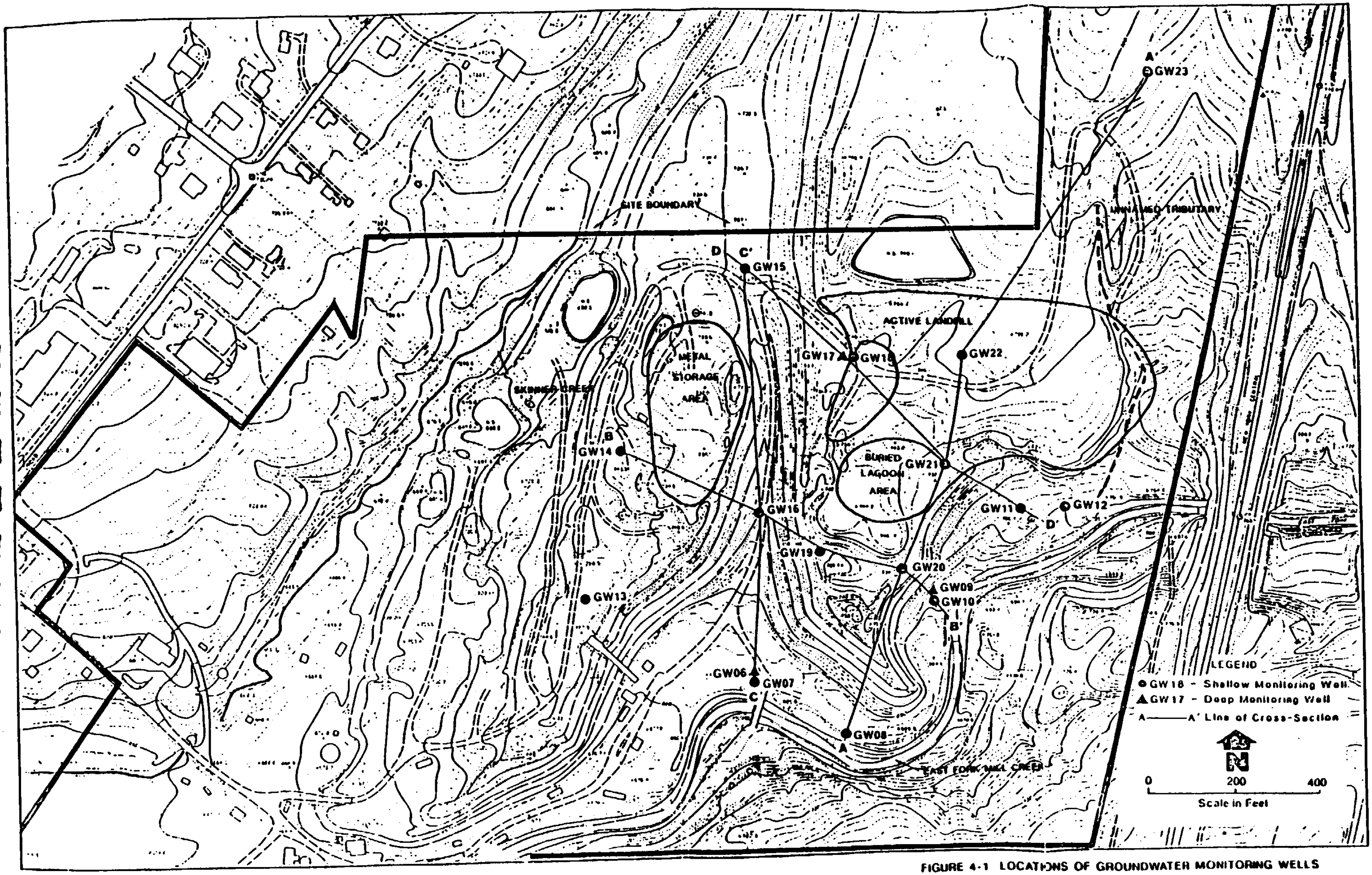

FIGURE 4-1 LOCATIONS OF GROUNDWATER MONITORING WELLS AND GEOLOGIC CROSS-SECTIONS

TABLE F1

SUMMARY OF VOLATILE ORGANIC COMPOUND ANALYSES
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW06-01	GW06-02	GW07-01	GW07-02	GW08-01	GW08-DP	GW09-01	GW09-02	GW09-DP
PHASE	1	2	1	1	1	1	1	2	1
CRL LOG NUMBER	86RA01S26	86RA01697	86RA01S27	86RA01698	86RA01S28	86RA01D28	86RA01S29	86RA02S01	86RA01D29
TRAFFIC REPORT NUMBER	EH518	EH295	EH519	EH543	EH520	EH521	EH522	EH546	EH572
DATE COLLECTED	05/23/86	08/21/86	05/23/86	08/21/86	05/19/86	05/19/86	05/15/86	08/21/86	05/16/86
UNITS	UG/KG	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
1,1,1-Trichloroethane	------	------	------	------	------	------	------	------	------
1,1-Dichloroethane	------	------	1 J	------	------	------	------	------	------
2-Butanone	40 JB	------	4 JB	------	------	4 JB	------	------	------
Acetone	500 B	15	12 B	------	5 J	5 JB	------	9.5 J	13 B
Benzene	------	1.6 J	------	------	------	------	------	------	------
Carbon Tetrachloride	------	------	------	------	------	------	------	------	------
Chlorobenzene	------	------	------	------	------	------	------	------	------
Chloroethane	------	------	------	------	------	------	------	------	------
Chloroform	------	------	------	------	------	------	------	------	------
Ethylbenzene	------	------	------	------	------	------	------	------	------
Methylene Chloride	15 JB	------	6 B	------	4 J	2 JB	------	3.3 J	2 JB
Tetrachloroethene	------	------	------	------	------	------	4 J	------	1 J
Toluene	------	1.3 J	------	------	------	------	3 JB	1.3 J	1 JB
Total Xylenes	------	------	------	------	------	------	------	------	------
Trans-1,2-Dichloroethene	------	------	27	11	------	------	------	------	------
Vinyl Chloride	------	------	4 J	------	------	------	------	------	------

J = Estimated Value
B = Compound Detected in Lab Blank

TABLE F1 (cont'd)
SUMMARY OF VOLATILE ORGANIC COMPOUND ANALYSES
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW15-02	GW16-01	GW16-02	GW16-BK	GW17-01	GW17-02	GW17-BP	GW18-01	GW18-02
PHASE	2	1	2	2	1	2	2	1	2
CRL LOG NUMBER	86RA02S07	86RA01S36	86RA02S08	86RA02R08	86RA01S37	86RA02S09	86RA02B09	86RA01S38	86RA02S10
TRAFFIC REPORT NUMBER	EM576	EH529	EM577	EH551	EH530	EH578	EH547	EH531	EH579
DATE COLLECTED	08/20/86	05/13/86	08/20/86	08/20/86	05/13/86	08/19/86	08/19/86	05/13/86	08/19/86
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
1,1,1-Trichloroethane	------	12	------	2.6 J	------	------	------	------	------
1,1-Dichloroethane	------	------	------	------	------	------	------	------	------
2-Butanone	------	------	------	------	------	------	------	36 J	------
Acetone	------	2 J	------	------	14 J	------	------	------	------
Benzene	------	------	------	------	340	------	------	950	------
Carbon Tetrachloride	------	------	------	------	------	------	------	------	------
Chlorobenzene	------	------	------	------	------	------	------	------	------
Chloroethane	------	------	------	------	------	------	------	------	------
Chloroform	------	------	------	------	------	------	------	------	------
Ethylbenzene	------	------	------	------	------	------	------	------	------
Methylene Chloride	------	7	------	5.6 B	14	------	92 B	20 JB	------
Tetrachloroethene	------	------	------	------	20 J	------	------	------	------
Toluene	3.8 JB	------	3.8 JB	5.3 B	4 JB	3.6 JB	20 JB	------	3.3 JB
Total Xylenes	------	------	------	------	------	------	------	------	------
Trans-1,2-Dichloroethene	------	------	------	------	------	------	------	------	------
Vinyl Chloride	------	------	------	------	------	------	------	------	------

J = Estimated Value
B = Compound Detected in Lab Blank

TABLE F2

SUMMARY OF SEMIVOLATILE ORGANIC COMPOUND ANALYSES
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW07-02	GW08-DP	GW09-01	GW09-02	GW09-DP	GW10-01	GW10-02	GW11-01	GW11-02
PHASE	2	1	1	2	1	1	2	1	2
CRL LOG NUMBER	86RA01S98	86RA01D28	86RA01S29	86RA02S01	86RA01D29	86RA01S30	86RA02S02	86RA01S31	86RA02S03
TRAFFIC REPORT NUMBER	EH543	EH521	EH522	EH546	EH572	EH523	EH548	EH524	EH549
DATE COLLECTED	08/21/86	05/19/86	05/15/86	08/21/86	05/16/86	05/15/86	08/21/86	05/18/86	08/21/86
UNITS	UG/L		UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
1,4-Dichlorobenzene	------	------	------	------	------	------	------	------	------
2-Methylnaphthalene	------	------	------	------	------	------	------	------	------
4-Chloroaniline	------	------	------	------	------	------	------	------	------
4-Methylphenol	------	------	------	------	------	------	------	------	------
Benzoic Acid	------	------	------	------	------	------	------	------	------
Butylbenzylphthalate	------	------	------	------	------	------	------	------	------
Di-n-Butylphthalate	------	------	------	------	------	------	------	3 J	------
Diethylphthalate	------	------	------	------	------	------	------	------	------
Methylene Chloride	------	------	------	------	------	------	------	------	------
N-Nitrosodiphenylamine	1.2 J	------	------	------	------	------	------	------	------
Napthalene	------	------	------	------	------	------	------	------	------
Pentachlorophenol	------	------	------	260	------	------	------	------	------
Phenol	------	6 J	------	------	------	------	------	------	------
Tetrachloroethene	------	------	------	------	------	------	------	------	------
bis(2-Chloroethyl)Ether	------	------	------	------	------	23 J	30	------	------
bis(2-Chloroisopropyl)Ether	------	------	------	------	------	------	------	------	1.0 J
bis(2-Ethylhexyl)Phthalate	5.4 JB	------	3 J	21 JB	2 J	------	------	------	------

J = Estimated Value
B = Compound Detected in Lab Blank

TABLE F2 (cont'd)

SUMMARY OF SEMIVOLATILE ORGANIC COMPOUND ANALYSES
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW18-01	GW18-02	GW19-01	GW19-02	GW20-01	GW20-02	GW21-01	GW22-01	GW22-02
PHASE	1	2	1	2	1	2	1	1	2
CRL LOG NUMBER	86RA01S38	86RA02S10	86RA01S39	86RA02S11	86RA01S40	86RA02S12	86RA01S41	86RA01S42	86RA02S14
TRAFFIC REPORT NUMBER	EH531	EH579	EH532	EH580	EH534	EH581	EH535	EH536	EH762
DATE COLLECTED	05/13/86	08/19/86	05/22/86	08/20/86	05/22/86	08/20/86	05/19/86	05/13/86	08/19/86
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
1,4-Dichlorobenzene	------	8.2 J	------	------	------	------	------	------	------
2-Methylnaphthalene	------	------	------	------	------	------	------	3 J	------
4-Chloroaniline	------	------	------	------	------	------	------	7 J	46 J
4-Methylphenol	------	------	------	------	------	140	------	------	------
Benzoic Acid	------	------	------	------	------	2800	------	------	------
Butylbenzylphthalate	------	------	------	------	------	------	------	------	------
Di-n-Butylphthalate	2 J	------	2 J	------	------	------	2 J	------	------
Diethylphthalate	------	------	------	------	------	------	------	------	------
N-Nitrosodiphenylamine	------	------	------	------	------	------	------	------	------
Napthalene	10 J	------	------	------	------	------	------	17 J	29 J
Pentachlorophenol	------	------	------	220 J	------	250 J	------	------	------
Phenol	------	------	------	------	------	------	------	------	34 J
bis(2-Chloroethyl)Ether	------	------	------	------	180	------	------	------	------
bis(2-Chloroisopropyl)Ether	------	------	------	------	------	------	------	------	------
bis(2-Ethylhexyl)Phthalate	------	------	------	------	------	------	------	------	------

TABLE F3

SUMMARY OF PESTICIDE/PCB COMPOUND ANALYSES
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW06-02	GW16-02	GW17-02	GW17-DP	GW18-02	GW20-02
PHASE	2	2	2	2	2	2
CRL LOG NUMBER	86RA01S97	86RA02808	86RA02809	86RA02809	86RA02810	86RA02812
TRAFFIC REPORT NUMBER	EH295	808	EH578	809	EH579	EH581
DATE COLLECTED	08/21/86	08/20/86	08/19/86	08/19/86	08/19/86	08/20/86
UNITS	UG/L	UG/L		UG/L	UG/L	UG/L
Dieldrin	0.13	------	------	------	------	------
Hexachlorobenzene	------	0.04 J	0.02 J	0.03 J	0.02 J	------
Hexachlorocyclopentadiene	------	------	------	------	------	0.04 J

J = Estimated Value

TABLE F4

SUMMARY OF INORGANIC COMPOUND ANALYSES
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW06-01	GW06-02	GW07-01	GW07-02	GW08-01	GW08-01D	GW08-BP	GW08-BPD	GW09-01
PHASE	1	2	1	2	1	1	1	1	1
CRL LOG NUMBER	86RA01S26	86RA01S97	86RA01S27	86RA01S98	86RA01S28	86RA01S28	86RA01D28	86RA01D28	86RA01S29
TRAFFIC REPORT NUMBER	MEJ128	MEJ150	MEJ129	MEJ151	MEJ130	MEJ130	MEJ131	MEJ131	MEJ132
					U		U		
DATE COLLECTED	05/23/86	08/21/86	05/23/86	08/21/86	05/19/86	05/19/86	05/19/86	05/19/86	05/15/86
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Aluminum	773	67	------	49	13700	------	20900	------	------
Arsenic	------	------	------	------	8	------	16	------	------
Barium	180	70	109	96	93	56	144	56	41
Beryllium	------	------	------	------	------	------	------	------	------
Calcium	63100	33700	126000	178000	193000	160000	316000	141000	9720
Chromium	23	------	------	6.1	21	------	31	------	------
Cobalt	------	------	------	------	------	------	------	------	------
Copper	------	7.7	------	10	40	------	37	------	2
Cyanide	------	------	------	------	------	------	------	------	------
Iron	596	47	55	67	22900	38	39300	33	------
Lead	------	------	4	------	14	8	24	4	------
Magnesium	8500	14000	22100	38900	30000	21400	49400	21500	16110
Manganese	------	18	578	2650	467	30	1120	30	------
Mercury	------	------	------	------	------	------	------	------	------
Nickel	------	------	------	16	26	------	40	------	------
Potassium	13200	50300	14500	11900	5400	1090	7100	1140	43450
Selenium	------	------	------	------	------	------	------	------	------
Sodium	52000	143000	29800	86600	10100	8510	12400	8310	30330
Vanadium	------	------	------	------	33	------	47	------	2.1
Zinc	10	5.7	------	19	94	11	139	------	------

U = Unfiltered Sample

TABLE F4 (cont'd)

SUMMARY OF INORGANIC COMPOUND ANALYSES
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW11-BKD	GW12-01	GW12-02	GW13-01	GW14-01	GW14-02	GW15-01	GW15-02	GW15-DP
PHASE	1	1	2	1	1	2	1	2	2
CRL LOG NUMBER	86RA01R31	86RA01S32	86RA02S04	86RA01S33	86RA01S34	86RA02S06	86RA01S35	86RA02S07	86RA02D07
TRAFFIC REPORT NUMBER	MEJ185	MEJ135	MEJ158	MEJ136	MEJ137	MEJ161	MEJ138	MEJ181	MEJ153
DATE COLLECTED	05/18/86	05/18/86	08/21/86	05/19/86	05/18/86	08/21/86	05/13/86	08/20/86	08/20/86
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Aluminum	------	------	92	------	------	43	------	46	37
Arsenic	------	------	------	------	------	------	------	------	------
Barium	------	97	82	------	------	51	82	154	86
Beryllium	------	------	------	------	------	3.9	------	------	------
Calcium	------	324200	274000	26000	48600	68400	136800	144000	166000
Chromium	------	6	7	------	------	4.3	------	------	15
Cobalt	------	7	9.1	------	------	------	5	------	------
Copper	------	4	15	------	------	9.3	------	7.9	8.5
Cyanide	------	------	------	------	------	------	------	------	------
Iron	50	------	137	84	154	47	787	46	35
Lead	------	------	------	8	4	------	------	------	------
Magnesium	------	105400	99500	18500	143000	18300	28610	23000	38100
Manganese	------	749	3130	33	39	59	2213	838	2340
Mercury	------	------	------	------	------	------	0.2	------	------
Nickel	------	44	45	------	------	------	------	------	13
Potassium	------	101000	48700	7410	1000	1700	5847	2280	11400
Selenium	------	------	------	------	------	------	------	------	------
Sodium	------	248400	184000	286000	6650	12200	76060	28600	79400
Vanadium	------	------	------	------	------	------	------	------	------
Zinc	------	1	58	------	------	9.8	18	7.8	26

U = Unfiltered Sample

TABLE F4 (cont'd)

SUMMARY OF INORGANIC COMPOUND ANALYSES
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW19-01D	GW19-02	GW20-01	GW20-01D	GW20-02	GW21-01	GW21-01D	GW22-01	GW22-02
PHASE	1	2	1	1	2	1	1	1	2
CRL LOG NUMBER	86RA01S39	86RA02S11	86RA01S40	86RA01S40	86RA02S12	86RA01S41	86RA01S41	86RA01S42	86RA02S14
TRAFFIC REPORT NUMBER	MEJ142	MEJ190	MEJ144	MEJ144	MEJ191	MEJ145	MEJ145	MEJ146	MEE990
			U			U			
DATE COLLECTED	05/22/86	08/20/86	05/22/86	05/22/86	08/20/86	05/19/86	05/19/86	05/13/86	08/19/86
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Aluminum	------	75	45700	------	545	26000	------	------	323
Arsenic	------	------	51	19	32	17	8	------	------
Barium	58	98	694	957	1080	236	141	84	220
Beryllium	------	------	------	------	------	------	------	------	------
Calcium	64000	113000	433000	160000	401000	385000	119300	90890	104000
Chromium	8	6.1	101	------	6	41	------	19	31
Cobalt	------	------	57	------	18	35	------	4	10
Copper	------	4.2	163	------	3.5	59	------	------	6.3
Cyanide	------	------	------	------	------	------	------	------	------
Iron	39	78	105000	5270	61800	58600	4320	73480	45300
Lead	------	------	79	4	------	27	5	------	5.8
Magnesium	28500	34600	109000	57200	72300	71300	35100	11890	19400
Manganese	33	182	2570	683	3830	3180	1530	520	696
Mercury	------	------	------	------	------	------	------	------	------
Nickel	------	------	150	25	40	71	------	------	20
Potassium	2800	4220	31400	22100	36000	53000	44300	5929	18600
Selenium	------	------	------	------	------	------	------	------	------
Sodium	4630	3900	82200	86300	83200	42800	44000	17100	63200
Vanadium	------	------	102	------	------	61	------	------	------
Zinc	------	6.6	441	------	60	150	------	18	47

U = Unfiltered Sample

TABLE F5

SUMMARY OF GENERAL TESTS ANALYSES
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW07-02	GW08-01	GW08-DP	GW09-02	GW10-01	GW10-02	GW11-01	GW11-02	GW12-02
PHASE	1	1	1	2	1	2	1	2	2
CRL LOG NUMBER	86RA01598	86RA01528	86RA01828	86RA02802	86RA01530	86RA02602	86RA01831	86RA02503	86RA02504
TRAFFIC REPORT NUMBER	MEJ151	2287E-01	2287E-02	MEJ154	2287E-03	MEJ156	2287E-04	MEJ157	MEJ158
DATE COLLECTED	08/21/86	05/19/86	05/19/86	08/21/86	05/15/86	08/21/86	05/18/86	08/21/86	08/21/86
UNITS	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
Alkalinity as CaCO3	1270	------	------	527	------	2610	------	1040	1360
Ammonia as Nitrogen	------	------	------	4.4	------	20	------	16	13
Chloride	42	------	------	46	------	200	------	270	220
Nitrate as Nitrogen	0.15	------	------	------	------	0.5	------	0.55	4.1
Sulfate	90	------	------	16	------	80	------	560	540
TSS	------	1890	1944	------	986	------	269	------	------

TABLE F5 (cont'd)

SUMMARY OF GENERAL TESTS ANALYSES
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW20-01	GW20-02	GW21-01	GW22-02
PHASE	1	2	1	2
CRL LOG NUMBER	86RA01S40	86RA02S12	86RA01S41	86RA02S14
TRAFFIC REPORT NUMBER	2287E-07	MEJ191	2287E-08	MEE990
DATE COLLECTED	05/22/86	08/20/86	05/19/86	08/19/86
UNITS	MG/L	MG/L	MG/L	MG/L
Alkalinity as CaCO3	------	3040	------	11400
Ammonia as Nitrogen	------	36	------	3.5
Chloride	------	840	------	82
Nitrate as Nitrogen	------	------	------	------
Sulfate	------	------	------	37
TSS	2860	------	3690	------

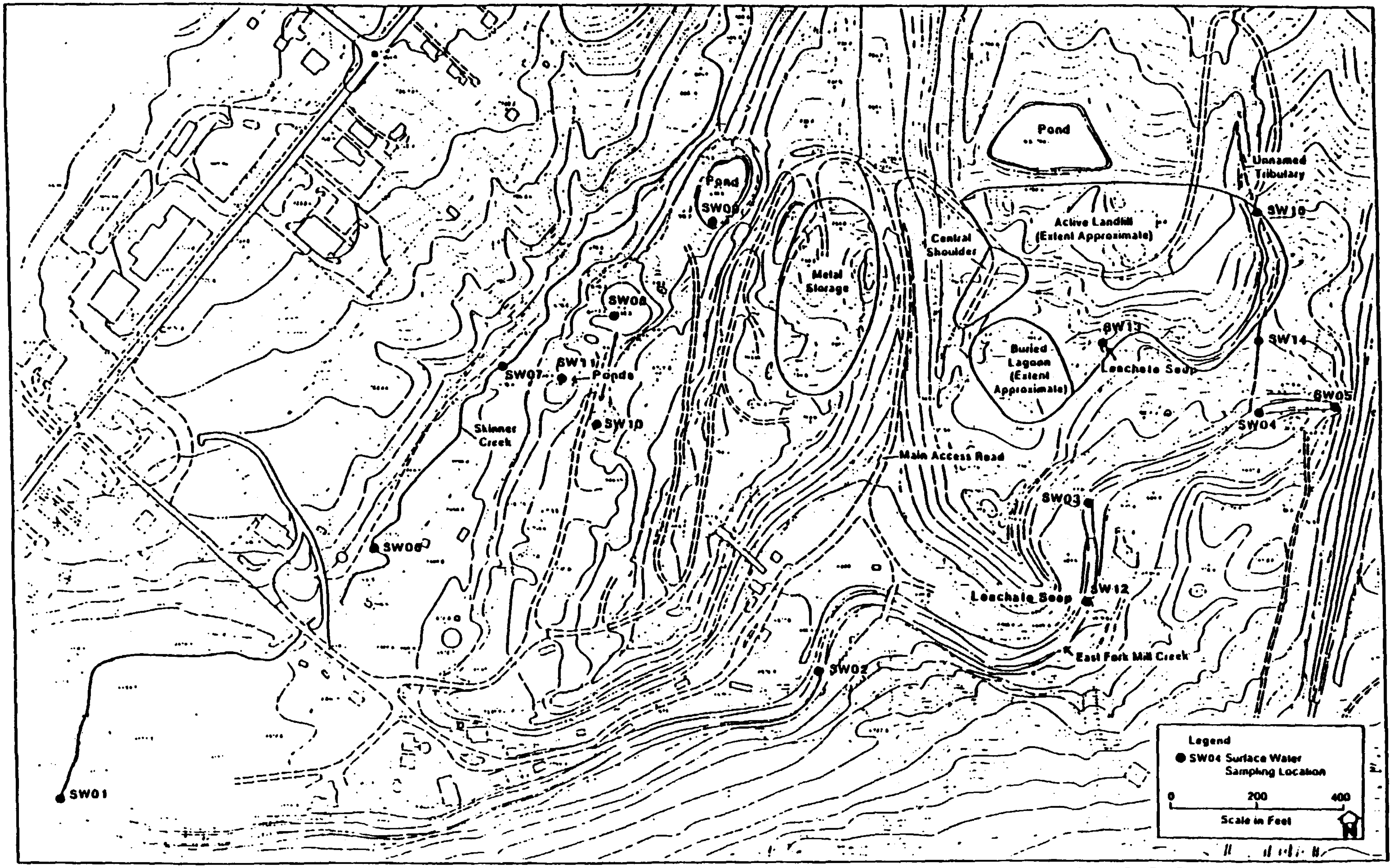

FIGURE 2-3 SURFACE WATER SAMPLE LOCATIONS

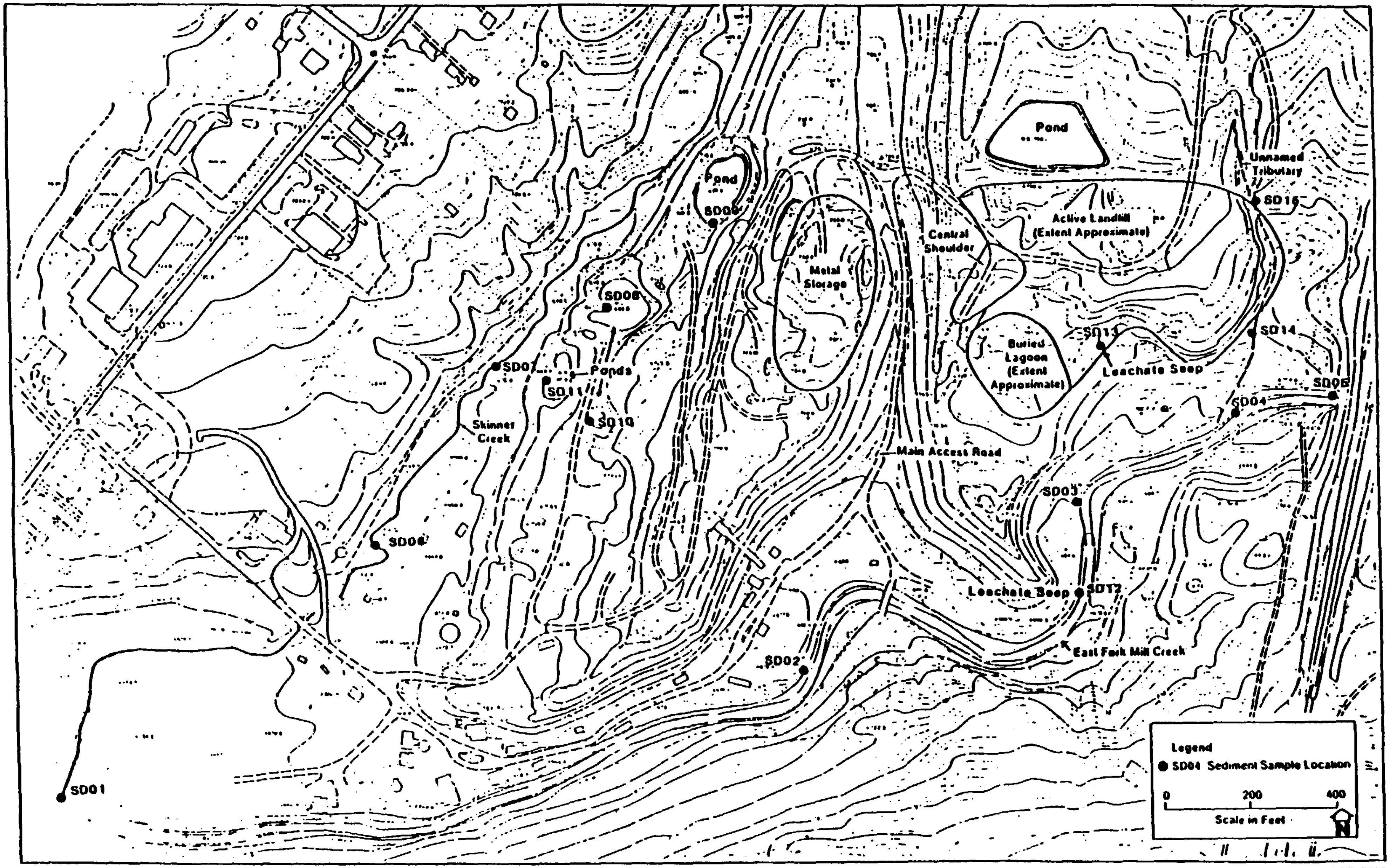

FIGURE 2-4 SEDIMENT SAMPLE LOCATIONS

TABLE F6

SUMMARY OF VOLATILE ORGANIC COMPOUND ANALYSES
SURFACE WATER SAMPLES
SKINNER LANDFILL

	SW01-01	SW02-01	SW03-01	SW04-01	SW05-01	SW06-01	SW07-01	SW07-BK	SW07-DP
PHASE	I	I	I	I	I	I	I	I	I
CRL LOG NUMBER	86RA01S54	86RA01S56	86RA01S58	86RA01S60	86RA01S62	86RA01S64	86RA01S66	86RA01R66	86RA01D66
TRAFFIC REPORT NUMBER	EH552	EH553	EH554	EH555	EH556	EH557	EH558	EH571	EH559
DATE COLLECTED	05/04/86	05/04/86	05/04/86	05/04/86	05/04/86	05/05/86	05/05/86	05/07/86	05/05/86
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
1,1,1-Trichloroethane	------	------	------	------	------	------	------	0.3 J	------
1,1-Dichloroethane	------	------	------	------	------	------	------	------	------
2-Butanone	8.5 JB	8.2 JB	5.8 JB	7.5 JB	7.8 JB	6.7 JB	7.3 JB	8.5 JB	7.6 JB
4-Methyl-2-Pentanone	------	------	------	------	------	------	------	0.1 JB	------
Acetone	14.4 B	14.3 B	13.6 B	13.7 B	10.2 B	12.4 B	12.0 B	14.0 B	13.2 B
Benzene	------	------	------	------	------	------	------	0.1 J	------
Bromodichloromethane	------	------	------	------	------	------	------	2.3 J	------
Bromoform	------	------	------	------	------	------	------	1.7 J	------
Carbon Disulfide	0.3 J	------	------	------	------	------	------	------	------
Chloroethane	------	------	------	------	------	------	------	------	------
Chloroform	------	------	------	------	------	------	------	3.8 J	------
Dibromochloromethane	------	------	------	------	------	------	------	3.2 J	------
Methylene Chloride	14.2 B	6.2 B	8.3 B	10.8 B	15.4 B	4.5 JB	8.3 B	11.1 B	10.3 B
Toluene	------	------	------	------	0.5 J	------	------	1.4 J	------
Trans-1,2-Dichloroethene	------	------	------	------	------	------	------	------	------

J = Estimated Value
B = Compound Detected in Lab Blank

TABLE F6 (cont'd)

SUMMARY OF VOLATILE ORGANIC COMPOUND ANALYSES
SURFACE WATER SAMPLES
SKINNER LANDFILL

	SW08-01	SW09-01	SW10-01	SW11-01	SW12-01	SW12-DP	SW13-01	SW13-BK	SW14-01
PHASE	1	1	1	1	1	1	1	1	1
CRL LOG NUMBER	86RA01S68	86RA01S69	86RA01S70	86RA01S71	86RA01S72	86RA01D72	86RA01S73	86RA01R73	86RA01S74
TRAFFIC REPORT NUMBER	EH560	EH561	EH562	EH563	EH564	EH565	EH566	EH567	EH568
DATE COLLECTED	05/05/86	05/05/86	05/07/86	05/07/86	05/07/86	05/07/86	05/07/86	05/07/86	05/07/86
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
1,1,1-Trichloroethane	------	------	------	------	------	------	------	------	------
1,1-Dichloroethane	------	------	------	------	6	5 J	------	------	------
2-Butanone	------	7.6 JB	7.4 JB	------	------	------	------	------	------
4-Methyl-2-Pentanone	------	------	------	------	------	------	------	------	------
Acetone	10.1 B	12.2 B	10.6 B	21 B	------	------	------	12 B	------
Benzene	------	------	------	------	------	------	------	------	------
Bromodichloromethane	------	------	------	------	------	------	------	2 J	------
Bromoform	------	------	------	------	------	------	------	------	------
Carbon Disulfide	------	------	0.6 JB	------	------	------	------	------	------
Chloroethane	------	------	------	------	40	37	------	------	------
Chloroform	------	------	------	------	------	------	------	4 J	------
Dibromochloromethane	------	------	------	------	------	------	------	3 J	------
Methylene Chloride	20.8 B	7.2 B	7.3 B	10 B	7 B	5 J	7 B	8 B	9 B
Toluene	------	------	0.5 J	------	------	------	------	------	------
Trans-1,2-Dichloroethene	------	------	------	------	2 J	2 J	------	------	------

J = Estimated Value
B = Compound Detected in Lab Blank

TABLE F6 (cont'd)
SUMMARY OF VOLATILE ORGANIC COMPOUND ANALYSES
SURFACE WATER SAMPLES
SKINNER LANDFILL

	SW15-01	
PHASE	1	
CRL LOG NUMBER	86RA01575	
TRAFFIC REPORT NUMBER	EH569	
DATE COLLECTED	05/07/86	
UNITS	UG/L	
1,1,1-Trichloroethane	------	
1,1-Dichloroethane	------	
2-Butanone	------	
4-Methyl-2-Pentanone	------	
Acetone	8	JB
Benzene	------	
Bromodichloromethane	------	
Bromoform	------	
Carbon Disulfide	------	
Chloroethane	------	
Chloroform	------	
Dibromochloromethane	------	
Methylene Chloride	7	B
Toluene	------	
Trans-1,2-Dichloroethene	------	

J = Estimated Value
B = Compound Detected in Lab Blank

TABLE F7

SUMMARY OF VOLATILE ORGANIC COMPOUND ANALYSES
SEDIMENT SAMPLES
SKINNER LANDFILL

	SD01-01	SD02-01	SD03-01	SD03-DP	SD04-01	SD05-01	SD06-01	SD07-01	SD07-DP
PHASE	1	1	1	1	1	1	1	1	1
CRL LOG NUMBER	86RA01S77	86RA01S78	86RA01S79	86RA01D79	86RA01S80	86RA01S81	86RA01S82	86RA01S83	86RA01D83
TRAFFIC REPORT NUMBER	EH540	EH541	EH542	EH586	EH587	EH588	EH589	EH590	EH591
DATE COLLECTED	05/04/86	05/04/86	05/04/86	05/05/86	05/04/86	05/04/86	05/05/86	05/05/86	05/05/86
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
1,1,2,2-Tetrachloroethane	------	------	------	------	------	------	------	------	2.0 J
1,1-Dichloroethane	------	------	------	------	------	------	------	------	------
2-Butanone	17.3 B	14.1 B	14.5 B	20.9 B	------	14.9 B	13.6 JB	------	24.5 B
2-Hexanone	------	------	------	------	------	------	------	------	5.1 J
4-Methyl-2-Pentanone	1.6 J	1.3 J	1.3 J	------	1.1 J	1.0 JB	------	------	4.9 J
Acetone	32.7 B	22.6 B	30.3 B	54.2 B	54.8 B	22.6 B	28.9 B	22.0 B	------
Benzene	------	------	------	------	------	------	------	------	------
Carbon Disulfide	1.2 J	0.9 J	1.4 J	------	0.4 J	1.3 JB	------	0.8 JB	0.6 JB
Ethylbenzene	------	------	------	------	------	------	------	------	------
Methylene Chloride	43.5 B	31.7 B	27.2 B	40.1 B	23.9 B	22.4 B	21.4 B	14.7 B	17.9 B
Toluene	------	------	------	------	------	0.7 JB	0.5 JB	0.5 JB	0.6 JB
Total Xylenes	------	------	------	------	------	------	------	------	------
Trichloroethene	------	------	------	------	------	------	------	------	------

J = Estimated Value
B = Compound Detected in Lab Blank

TABLE F7 (cont'd)
SUMMARY OF VOLATILE ORGANIC COMPOUND ANALYSES
SEDIMENT SAMPLES
SKINNER LANDFILL

	SD08-01	SD09-01	SD10-01	SD11-01	SD12-01	SD13-01	SD14-01	SD15-01
PHASE	1	1	1	1	1	1	1	1
CRL LOG NUMBER	86RA01S84	86RA01S85	86RA01S86	86RA01S87	86RA01S88	86RA01S89	86RA01S90	86RA01S91
TRAFFIC REPORT NUMBER	EH592	EH593	EH594	EH595	EH596	EH597	EH598	EH599
DATE COLLECTED	05/05/86	05/05/86	05/07/86	05/07/86	05/07/86	05/07/86	05/07/86	05/12/86
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
1,1,2,2-Tetrachloroethane	------	------	------	------	------	------	------	------
1,1-Dichloroethane	0.6 J	29.9	------	------	------	------	------	------
2-Butanone	20.3 B	46.8 B	------	------	------	------	------	------
2-Hexanone	------	------	------	------	------	------	------	------
4-Methyl-2-Pentanone	1.9 J	------	------	------	------	------	------	------
Acetone	73.6 B	166.3 B	230	470	280	220	110	310
Benzene	------	40.3	------	------	9 J	57	------	------
Carbon Disulfide	0.8 JB	2.7 JB	------	------	------	------	------	------
Ethylbenzene	------	74.0	------	------	------	------	------	------
Methylene Chloride	15.8 B	17.0 B	140 B	260 B	270 B	88 B	59 B	960
Toluene	0.8 JB	25.6 B	------	------	------	5 J	------	------
Total Xylenes	------	261.0	------	------	------	------	------	------
Trichloroethene	------	1.6 J	------	------	------	------	------	------

J = Estimated Value
B = Compound Detected in Lab Blank

TABLE F8

SUMMARY OF SEMIVOLATILE ORGANIC COMPOUND ANALYSES
SURFACE WATER SAMPLES
SKINNER LANDFILL

	SW01-01	SW02-01	SW03-01	SW04-01	SW05-01	SW06-01	SW07-01	SW07-BK	SW07-BP
PHASE	1	1	1	1	1	1	1	1	1
CRL LOG NUMBER	86RA01554	86RA01556	86RA01558	86RA01560	86RA01562	86RA01564	86RA01566	86RA01R66	86RA01B66
TRAFFIC REPORT NUMBER	EH552	EH553	EH554	EH555	EH556	EH557	EH558	EH571	EH558
DATE COLLECTED	05/04/86	05/04/86	05/04/86	05/04/86	05/04/86	05/05/86	05/05/86	05/07/86	05/05/86
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
1,2-Dichlorobenzene	------	------	------	------	------	------	------	------	------
Butylbenzylphthalate	------	------	------	0.1 J	------	------	------	------	------
Di-n-Butylphthalate	0.1 J	------	------	------	0.1 J	------	------	------	------
Di-n-Octylphthalate	------	4.3 J	------	------	------	------	------	------	3.6 J
Phenol	0.9 J	8.9 J	0.6 J	3.2 J	0.5 J	------	------	------	------
bis(2-Chloroethyl)Ether	------	------	------	------	------	------	------	------	------
bis(2-Ethylhexyl)Phthalate	3.4 JB	81.6 B	1.2 JB	11.5 B	2.9 JB	16.8 B	14.0 B	1.9 JB	131.9 B

J = Estimated Value
B = Compound Detected in Lab Blank

TABLE F8 (cont'd)

SUMMARY OF SEMIVOLATILE ORGANIC COMPOUND ANALYSES
SURFACE WATER SAMPLES
SKINNER LANDFILL

	SW08-01	SW09-01	SW10-01	SW12-01	SW12-DP	SW13-01
PHASE	1	1	1	1	1	1
CRL LOG NUMBER	86RA01868	86RA01869	86RA01870	86RA01872	86RA01872	86RA01873
TRAFFIC REPORT NUMBER	EH560	EH561	EH562	EH564	EH565	EH566
DATE COLLECTED	05/05/86	05/05/86	05/07/86	05/07/86	05/07/86	05/07/86
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
1,2-Dichlorobenzene	------	------	------	------	------	5 J
Butylbenzylphthalate	------	------	------	------	------	------
Di-n-Butylphthalate	------	------	------	------	------	------
Di-n-Octylphthalate	------	------	------	------	------	------
Phenol	1.7 J	2.2 J	------	------	------	10 J
bis(2-Chloroethyl)Ether	------	------	------	206	202	------
bis(2-Ethylhexyl)Phthalate	0.9 JB	40.9 B	1.4 JB	------	------	------

J = Estimated Value
B = Compound Detected in Lab Blank

TABLE F9

SUMMARY OF SEMIVOLATILE ORGANIC COMPOUND ANALYSES
SEDIMENT SAMPLES
SKINNER LANDFILL

	SD01-01	SD02-01	SD03-01	SD03-BP	SD04-01	SD05-01	SD06-01
PHASE	1	1	1	1	1	1	1
CRL LOG NUMBER	86RA01S77	86RA01S78	86RA01S79	86RA01D79	86RA01S80	86RA01S81	86RA01S82
TRAFFIC REPORT NUMBER	EH540	EH541	EH542	EH586	EH587	EH588	EH589
DATE COLLECTED	05/04/86	05/04/86	05/04/86	05/05/86	05/04/86	05/04/86	05/05/86
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
2-Methylnaphthalene	5.8 J	4.5 J	-----	2.0 J	-----	8.7 J	-----
4-Methylphenol	1534.2	16.5 J	21.0 J	90.6 J	14.7 J	276.5 J	10.5 J
Acenaphthene	-----	-----	-----	-----	-----	51.3 J	-----
Acenaphthylene	-----	18.4 J	-----	-----	-----	-----	-----
Anthracene	67.9 J	348.6 J	-----	96.4 J	-----	90.3 J	-----
Benzo(a)Anthracene	363.5 J	258.0 J	-----	47.6 J	-----	255.2 J	-----
Benzo(a)Pyrene	705.7	309.5 J	-----	-----	-----	464.4	8.4 J
Benzo(b)Fluoranthene	325.6 J	258.5 J	-----	36.6 J	-----	226.9 J	11.6 J
Benzo(g,h,i)Perylene	256.6 J	162.9 J	-----	-----	-----	143.5 J	-----
Benzo(k)Fluoranthene	338.0 J	198.9 J	-----	37.5 J	-----	179.4 J	14.6 J
Butylbenzylphthalate	-----	-----	-----	-----	-----	51.7 J	-----
Chrysene	433.2 J	275.4 J	-----	60.2 J	-----	276.4 J	-----
Di-n-Butylphthalate	153.6 JB	164.0 JB	110.8 JB	104.4 JB	60.1 JB	33.2 JB	35.4 J
Dibenzo(a,h)Anthracene	-----	-----	-----	-----	-----	32.7 J	-----
Dibenzofuran	-----	-----	-----	-----	-----	25.1 J	-----
Diethylphthalate	35.0 J	42.9 J	51.7 J	33.5 J	28.1 J	29.1 J	21.0 J
Fluoranthene	796.7	591.5	-----	137.0 J	-----	606.8	31.3 J
Fluorene	28.9 J	27.1 J	-----	-----	-----	54.4 J	-----
Indeno(1,2,3-cd)Pyrene	211.1 J	147.3 J	-----	-----	-----	124.4 J	-----
Isophorone	-----	-----	-----	-----	8.2 J	-----	114.3 J
N-Nitrosodiphenylamine	-----	-----	-----	-----	-----	2.4 J	-----
Napthalene	-----	-----	-----	-----	-----	12.9 J	-----
Nitrobenzene	-----	-----	-----	-----	-----	-----	-----
Phenanthrene	396.1 J	338.2 J	-----	90.5 J	-----	443.9	15.1 J
Phenol	139.7 J	55.0 J	59.6 J	95.5 J	45.6 J	84.4 JB	15.1 J
Pyrene	721.2	517.9	-----	89.0 J	-----	461.3	21.7 J
bis(2-Ethylhexyl)Phthalate	108.4 JB	104.3 JB	73.7 JB	83.9 JB	65.4 JB	394.4 JB	107.6 J

J = Estimated Value
B = Compound Detected in Lab Blank

TABLE F9 (cont'd)

SUMMARY OF SEMIVOLATILE ORGANIC COMPOUND ANALYSES
SEDIMENT SAMPLES
SKINNER LANDFILL

	SD07-01	SD07-DP	SD08-01	SD09-01	SD12-01	SD14-01	SD15-01
PHASE	1	1	1	1	1	1	1
CRL LOG NUMBER	86RA01S83	86RA01D83	86RA01S84	86RA01S85	86RA01S88	86RA01S90	86RA01S91
TRAFFIC REPORT NUMBER	EH590	EH591	EH592	EH593	EH596	EH598	EH599
DATE COLLECTED	05/05/86	05/05/86	05/05/86	05/05/86	05/07/86	05/07/86	05/07/86
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
2-Methylnaphthalene	23.5 J	100.7 J	2.1 J	-----	225 J	-----	-----
4-Methylphenol	11.5 J	19.1 J	19.6 J	-----	-----	-----	-----
Acenaphthene	-----	-----	-----	-----	246 J	-----	-----
Acenaphthylene	-----	-----	-----	-----	480	-----	-----
Anthracene	14.6 J	14.0 J	-----	-----	1915	-----	-----
Benzo(a)Anthracene	87.6 J	183.0 J	-----	-----	3050	124 J	-----
Benzo(a)Pyrene	91.5 J	92.8 J	-----	-----	3484	159 J	125 J
Benzo(b)Fluoranthene	95.2 J	89.5 J	-----	134.1 J	3784	124 J	103 J
Benzo(g,h,i)Perylene	48.0 J	-----	-----	-----	843	55 J	-----
Benzo(k)Fluoranthene	63.9 J	63.1 J	-----	-----	-----	79 J	87 J
Butylbenzylphthalate	-----	-----	-----	-----	-----	-----	-----
Chrysene	103.0 J	193.0 J	-----	-----	2320	129 J	120 J
Di-n-Butylphthalate	35.5 JB	36.4 JB	18.2 JB	-----	-----	-----	-----
Dibenzo(a,h)Anthracene	-----	-----	-----	-----	110 J	-----	-----
Dibenzofuran	7.3 J	21.2 J	-----	-----	684	-----	-----
Diethylphthalate	26.1 J	28.3 J	21.2 J	-----	-----	-----	-----
Fluoranthene	188.4 J	172.5 J	8.8 J	-----	6925	253 J	250 J
Fluorene	8.0 J	9.8 J	-----	-----	1348	-----	-----
Indeno(1,2,3-cd)Pyrene	39.4 J	-----	-----	-----	1030	59 J	-----
Isophorone	-----	1.0 JB	-----	-----	-----	-----	-----
N-Nitrosodiphenylamine	-----	-----	-----	-----	-----	-----	-----
Napthalene	16.6 J	64.8 J	-----	134.1 J	463	-----	-----
Nitrobenzene	-----	4.2 J	-----	-----	-----	-----	-----
Phenanthrene	105.9 J	134.3 J	8.8 J	-----	6967	-----	152 J
Phenol	70.1 JB	68.8 JB	52.5 JB	74.2 JB	-----	-----	-----
Pyrene	154.9 J	142.8 J	7.3 J	690.7	4105	134 J	136 J
bis(2-Ethylhexyl)Phthalate	202.2 JB	179.6 JB	105.4 JB	134.1 J	54 J	258 J	33 J

J = Estimated Value
B = Compound Detected in Lab Blank

[redacted]

TABLE F10

SUMMARY OF PESTICIDE/PCB COMPOUND ANALYSES
SEDIMENT SAMPLES
SKINNER LANDFILL

	SD07-01	SD07-DP	SD09-01	SD10-01	SD13-01
PHASE	1	1	1	1	1
CRL LOG NUMBER	86RA01S83	86RA01D83	86RA01S85	86RA01S86	86RA01S89
TRAFFIC REPORT NUMBER	EH590	EH591	EH593	EH594	EH597
DATE COLLECTED	05/05/86	05/05/86	05/05/86	05/07/86	05/07/86
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
Aldrin	------	------	------	------	1.9 J
Aroclor-1260	11.43 J	29.85 J	442.19	------	------
Delta-BHC	------	------	------	0.5 J	------
Dieldrin	------	------	------	------	4.2 J
Endrin Ketone	------	------	------	------	24.1

J = Estimated Value

TABLE F11

SUMMARY OF INORGANIC COMPOUND ANALYSES
SURFACE WATER SAMPLES
SKINNER LANDFILL

	SW01-01	SW02-01	SW03-01	SW04-01	SW05-01	SW06-01	SW07-01	SW07-BK	SW07-DP
PHASE	I	I	I	I	I	I	I	I	I
CRL LOG NUMBER	86RA01S54	86RA01S56	86RA01S58	86RA01S60	86RA01S62	86RA01S64	86RA01S66	86RA01R66	86RA01D66
TRAFFIC REPORT NUMBER	MEJ162	MEJ163	MEJ164	MEJ165	MEJ166	MEJ167	MEJ168	MEJ182	MEJ169
DATE COLLECTED	05/04/86	05/04/86	05/04/86	05/04/86	05/04/86	05/05/86	05/05/86	05/07/86	05/05/86
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Aluminum	260	336	111	261	299	128	192	300	182
Arsenic	------	------	------	------	------	------	------	------	------
Barium	113	48	43	47	47	39	40	31	41
Beryllium	------	------	------	------	------	------	------	------	------
Calcium	98900	91300	90300	98800	92400	121000	124000	37800	127000
Chromium	------	12	------	------	------	------	------	------	------
Copper	------	------	------	------	------	------	------	------	------
Iron	59	364	118	246	258	96	187	416	145
Lead	1.3	1.2	------	------	1.4	1.0	------	------	------
Magnesium	28400	31900	31000	29900	28000	22900	22800	18600	22800
Manganese	67	15	7	15	15	35	39	68	40
Mercury	0.3	------	------	------	------	------	------	------	------
Nickel	------	------	------	------	------	------	------	------	------
Potassium	3260	4280	2300	2770	------	2220	3480	------	3410
Silver	------	------	------	------	------	------	------	------	------
Sodium	28100	26700	26200	24500	24900	41100	42800	1630	44400
Tin	------	------	------	------	------	------	41	54	51
Zinc	------	22	------	------	------	------	------	------	------

TABLE F11 (cont'd)
SUMMARY OF INORGANIC COMPOUND ANALYSES
SURFACE WATER SAMPLES
SKINNER LANDFILL

	SW08-01	SW09-01	SW11-01	SW12-01	SW12-DP	SW13-01	SW13-DK	SW14-01	SW15-01
PHASE	1	1	1	1	1	1	1	1	1
CRL LOG NUMBER	86RA01848	86RA01849	86RA01871	86RA01872	86RA01D72	86RA01873	86RA01R73	86RA01874	86RA01875
TRAFFIC REPORT NUMBER	MEJ170	MEJ171	MEJ173	MEJ174	MEJ175	MEJ176	MEJ177	MEJ178	MEJ179
DATE COLLECTED	05/05/86	05/05/86	05/07/86	05/07/86	05/07/86	05/07/86	05/07/86	05/07/86	05/07/86
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Aluminum	991	------	232	1940	1460	1680	------	1700	682
Arsenic	------	------	------	11	11	------	------	------	------
Barium	47	------	22	873	880	378	------	46	27
Beryllium	------	------	------	------	1	------	------	------	------
Calcium	97300	40100	38000	365000	370000	144000	------	159000	118000
Chromium	------	------	------	------	------	------	------	------	------
Copper	------	------	------	3.9	5	5.2	------	3.1	------
Iron	889	292	774	29000	27200	40100	------	2950	1060
Lead	------	------	------	5.3	------	7.5	19	9.2	------
Magnesium	26300	16000	17200	87500	88800	32500	------	40000	28100
Manganese	28	23	133	1140	1130	1150	------	173	35
Mercury	------	------	------	------	------	------	------	------	------
Nickel	------	------	------	19	23	15	------	------	------
Potassium	2600	------	2450	26200	26500	33800	------	6920	1970
Silver	------	------	3.1	3.6	------	------	------	------	------
Sodium	19500	2080	4890	42100	42800	39700	------	24400	13300
Tin	41	72	------	------	------	------	------	------	------
Zinc	12	------	19	56	58	44	13	45	12

TABLE F12

SUMMARY OF INORGANIC COMPOUND ANALYSES
SEDIMENT SAMPLES
SKINNER LANDFILL

	SD01-01	SD02-01	SD03-01	SD03-DP	SD04-01	SD05-01	SD06-01	SD07-01	SD07-DP
PHASE	1	1	1	1	1	1	1	1	1
CRL LOG NUMBER	86RA01S77	86RA01S78	86RA01S79	86RA01D79	86RA01S80	86RA01S81	86RA01S82	86RA01S83	86RA01D83
TRAFFIC REPORT NUMBER	MEJ193	MEJ194	MEJ195	MEJ196	MEJ197	MEJ198	MEJ199	MEJ200	MEE977
DATE COLLECTED	05/04/86	05/04/86	05/04/86	05/05/86	05/04/86	05/04/86	05/05/86	05/05/86	05/05/86
UNITS	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
Aluminum	8890	3200	9420	12600	7090	4940	11600	8860	10000
Antimony	46	34	44	46	49	31	------	42	46
Arsenic	------	4.0	8.6	9.0	7.9	7.4	10	8.9	18.2
Barium	143	35.0	62	100	36.0	36	96	97	83
Beryllium	------	------	------	------	------	------	------	------	------
Cadmium	------	------	4	5	------	------	4	------	------
Calcium	77200	242000	121000	47000	128000	123000	22300	65500	52100
Chromium	15	12	17	20	14	9	15	13	14
Cobalt	22	11	17	21	14	13	16	23	22
Copper	18	12	21	21	14	11	20	17	19
Iron	24100	13600	26400	29800	18600	15100	23400	21300	23800
Lead	43	12	14	12	7	12	21	46	66
Magnesium	9020	33200	16800	16500	22700	21000	5050	5050	5990
Manganese	2330	1020	711	899	730	694	803	1800	1400
Nickel	26	16	26	34	22	------	23	24	26
Potassium	------	1350	------	------	------	------	1850	------	------
Sodium	240	250	198	158	177	226	213	245	259
Tin	66	32	35	33	38	------	------	40	52
Vanadium	22	------	18	23	16	14	20	20	18
Zinc	82	29	100	79	46	40	57	76	88

TABLE F12 (cont'd)
SUMMARY OF INORGANIC COMPOUND ANALYSES
SEDIMENT SAMPLES
SKINNER LANDFILL

	SD08-01	SD09-01	SD10-01	SD11-01	SD12-01	SD13-01	SD14-01	SD15-01
PHASE	1	1	1	1	1	1	1	1
CRL LOG NUMBER	86RA01884	86RA01885	86RA01886	86RA01887	86RA01888	86RA01889	86RA01890	86RA01891
TRAFFIC REPORT NUMBER	NEE978	NEE979	NEE980	NEE981	NEE982	NEE983	NEE984	NEE985
DATE COLLECTED	05/05/86	05/05/86	05/07/86	05/07/86	05/07/86	05/07/86	05/07/86	05/07/86
UNITS	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
Aluminum	15900	13300	5780	14800	6190	9160	8540	9340
Antimony	56	53	------	------	------	------	------	------
Arsenic	20.8	23.8	------	------	10	17	------	10
Barium	24	49	23	54	357	164	78	94
Beryllium	------	------	------	0.88	------	0.91	------	0.83
Cadmium	4	4	------	------	------	------	------	------
Calcium	31700	99500	163000	33900	84800	16300	26100	25800
Chromium	26	24	9.7	23	9.5	16	13	12
Cobalt	26	24	7.1	16	------	10	9	17
Copper	23	24	16	61	22	38	30	30
Iron	35900	33200	16100	34600	61700	32100	21200	24500
Lead	9.0	511	9	14	31	66	194	25
Magnesium	14800	16200	30600	10800	15100	3820	6170	7050
Manganese	514	724	617	517	612	345	1100	1910
Nickel	44	35	16	40	14	21	18	22
Potassium	1820	2450	1360	3020	1960	1300	1460	1400
Sodium	279	247	1580	------	------	------	------	------
Tin	51	47	------	------	------	------	------	37
Vanadium	25	23	13	24	12	23	20	24
Zinc	85	131	49	108	257	165	100	59

TABLE F13

SUMMARY OF GENERAL TESTS ANALYSES
SURFACE WATER SAMPLES
SKINNER LANDFILL

	SW01-01	SW01-02	SW02-02	SW03-01	SW03-02	SW03-DP	SW04-01	SW04-02	SW05-01
PHASE	1	1	1	1	1	1	1	1	1
CRL LOG NUMBER	B6RA01S54	B6RA01S55	B6RA01S57	B6RA01S58	B6RA01S59	B6RA01D59	B6RA01S60	B6RA01S61	B6RA01S62
TRAFFIC REPORT NUMBER	2258E-1	2258E-9	2258E-10	2258E-3	2258E-11	2258E-12	2258E-4	2258E-13	2258E-5
DATE COLLECTED	05/04/86	05/08/86	05/08/86	05/04/86	05/08/86	05/08/86	05/04/86	05/08/86	05/04/86
UNITS	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
TSS	2.8	12.1	27.3	4.1	25.4	25.2	3.0	31.5	3.6

TABLE F13 (cont'd)

SUMMARY OF GENERAL TESTS ANALYSES
SURFACE WATER SAMPLES
SKINNER LANDFILL

	SW05-02	SW06-02	SW07-01	SW07-02	SW07-DP
PHASE	I	I	I	I	I
CRL LOG NUMBER	86RA01843	86RA01845	86RA01846	86RA01847	86RA01846
TRAFFIC REPORT NUMBER	2250E-15	2250E-16	2250E-7	2250E-17	2250E-8
DATE COLLECTED	05/08/86	05/08/86	05/05/86	05/08/86	05/05/86
UNITS	MG/L	MG/L	MG/L	MG/L	MG/L
TSS	27.2	24.9	9.6	21.0	5.6

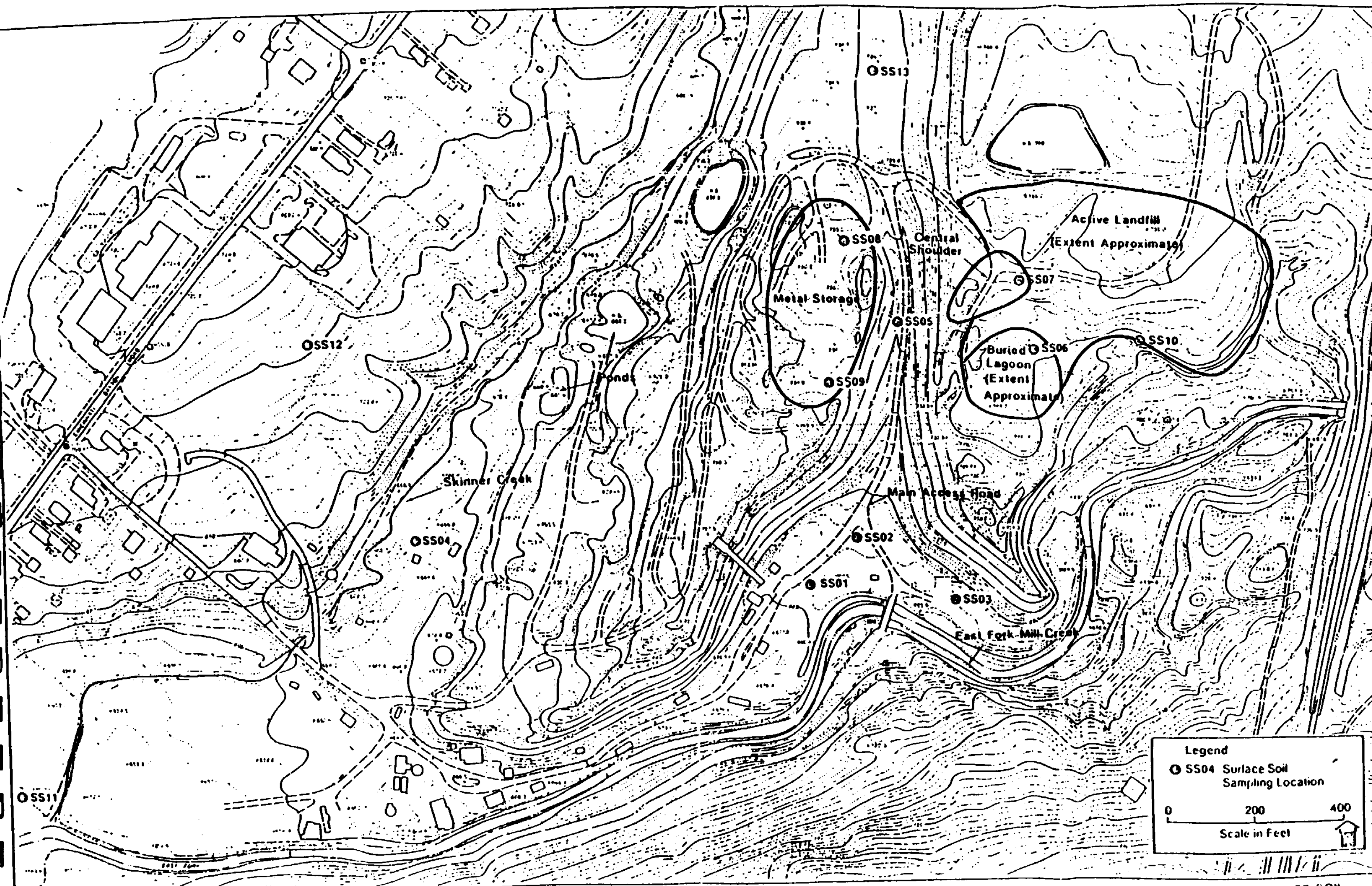

FIGURE 2-5 SURFACE SOIL SAMPLING LOCATIONS

TABLE F14

SUMMARY OF VOLATILE ORGANIC COMPOUND ANALYSES
SURFACE SOIL SAMPLES
SKINNER LANDFILL

	SS02-01	SS04-01	SS04-02	SS04-DP	SS05-01	SS05-02	SS06-01	SS06-02	SS08-01
PHASE	I	I	I	I	I	I	I	I	I
CRL LOG NUMBER	86RA01504	86RA01507	86RA01508	86RA01008	86RA01509	86RA01510	86RA01511	86RA01512	86RA01515
TRAFFIC REPORT NUMBER	EH220	EH223	EH224	EH225	EH226	EH501	EH502	EH503	EH506
DATE COLLECTED	04/30/86	04/30/86	04/30/86	04/30/86	04/30/86	04/30/86	04/30/86	04/30/86	05/01/86
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	
1,1,1-Trichloroethane	------	------	------	------	------	4.9 J	------	------	------
2-Butanone	------	------	31 J	------	------	------	------	------	------
Acetone	13 J	11 J	11 J	8.9 J	9.7 J	------	14	14	------
Benzene	2.2 J	------	------	------	1.0 J	0.72 J	------	------	------
Carbon Bisulfide	------	------	------	------	------	------	------	------	------
Methylene Chloride	------	------	------	------	------	6.6 J	------	6.4 J	1.4 J
Tetrachloroethene	------	------	------	------	------	2.1 J	------	------	------
Toluene	0	------	------	------	------	2.6 J	------	3.8 J	------

J = Estimated Value

TABLE F15

SUMMARY OF SEMIVOLATILE ORGANIC COMPOUND ANALYSES
SURFACE SOIL SAMPLES
SKINNER LANDFILL

	SS01-01	SS01-02	SS02-01	SS02-02	SS03-01	SS03-02	SS05-01	SS05-02	SS06-02
PHASE	1	1	1	1	1	1	1	1	1
CRL LOG NUMBER	86RA01S01	86RA01S02	86RA01S03	86RA01S04	86RA01S05	86RA01S06	86RA01S09	86RA01S10	86RA01S12
TRAFFIC REPORT NUMBER	EH217	EH218	EH219	EH220	EH221	EH222	EH226	EH501	EH503
DATE COLLECTED	04/30/86	04/30/86	04/30/86	04/30/86	04/30/86	04/30/86	04/30/86	04/30/86	05/01/86
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
Acenaphthylene	------	------	------	------	------	------	940 J	------	------
Anthracene	------	------	------	------	340 J	------	------	------	------
Benzo(a)Anthracene	------	------	------	------	3100	120 J	4340 J	------	------
Benzo(a)Pyrene	------	------	------	------	5600	------	------	------	------
Benzo(b)Fluoranthene	------	------	------	------	4600	220 J	6170 J	550 J	------
Benzo(g,h,i)Perylene	------	------	------	470 J	1700 J	------	------	------	------
Benzo(k)Fluoranthene	760 J	210 J	------	460 J	------	------	------	------	------
Butylbenzylphthalate	------	------	------	------	7000	------	------	------	------
Chrysene	650 J	140 J	------	270 J	4200	170 J	5560 J	500 J	------
Di-n-Butylphthalate	------	------	------	------	------	------	------	------	------
Di-n-Octylphthalate	------	------	------	------	------	------	------	------	------
Fluoranthene	600 J	120 J	1400 J	280 J	4000	------	7900	350 J	------
Hexachlorobenzene	------	------	------	------	------	------	23000 J	------	------
Indeno(1,2,3-cd)Pyrene	------	------	------	320 J	1500 J	------	------	------	------
N-Nitrosodiphenylamine	------	------	------	------	------	------	------	------	------
Phenanthrene	------	------	750 J	------	3100	100 J	4200 J	------	------
Pyrene	630 J	130 J	1260 J	230 J	3600	------	8500	490 J	------
bis(2-Ethylhexyl)Phthalate	------	190 J	------	------	1500 J	------	1740 J	------	160 J

J = Estimated Value

TABLE F16

SUMMARY OF PESTICIDE/PCB COMPOUND ANALYSES
SURFACE SOIL SAMPLES
SKINNER LANDFILL

	SS07-01	SS07-02
PHASE	1	1
CRL LOG NUMBER	86RA01813	86RA01814
TRAFFIC REPORT NUMBER	EH504	EH505
DATE COLLECTED	05/01/86	05/01/86
UNITS	UG/KG	UG/KG
Aroclor-1254	980	980

TABLE F17
SUMMARY OF INORGANIC COMPOUND ANALYSES
SURFACE SOIL SAMPLES
SKINNER LANDFILL

	SS01-01	SS01-02	SS02-01	SS02-02	SS03-01	SS03-02	SS04-01	SS04-02	SS04-DP
PHASE	1	1	1	1	1	1	1	1	1
CRL LOG NUMBER	86RA01S01	86RA01S02	86RA01S03	86RA01S04	86RA01S05	86RA01S06	86RA01S07	86RA01S08	86RA01D08
TRAFFIC REPORT NUMBER	MEJ101	MEJ102	MEJ103	MEJ104	MEJ105	MEJ106	MEJ107	MEJ108	MEJ109
DATE COLLECTED	04/30/86	04/30/86	04/30/86	04/30/86	04/30/86	04/30/86	04/30/86	04/30/86	04/30/86
UNITS	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
Aluminum	6580	9040	7260	9610	6040	8290	10700	14700	14400
Antimony	------	------	------	------	------	------	------	------	------
Arsenic	------	9.1	6	6.8	------	------	------	------	------
Barium	84	96	125	143	93	101	74	53	53
Beryllium	------	------	------	0.65	------	------	------	0.7	0.89
Cadmium	------	------	------	------	------	------	------	------	------
Calcium	79000	73800	70500	66700	20800	8950	13200	34600	18100
Chromium	12	12	13	13	15	11	15	23	21
Cobalt	7.8	8.9	7.3	12	10	11	12	15	14
Copper	25	19	25	25	22	17	19	25	24
Cyanide	------	------	------	------	------	------	------	------	------
Iron	21300	25200	21300	26900	16900	20200	27300	35800	39400
Lead	86	39	51	43	61	27	19	6.8	7.1
Magnesium	15600	12600	16000	5860	7460	2380	4470	8170	8040
Manganese	1190	1400	2270	2780	856	1570	1090	561	576
Mercury	------	------	------	------	------	------	------	------	------
Nickel	18	22	19	28	17	14	21	31	33
Potassium	1310	1390	1120	1300	868	948	1250	2400	2020
Sodium	1020	903	------	786	------	------	------	753	698
Tin	------	------	------	------	------	------	------	------	------
Vanadium	15	21	15	22	15	16	23	26	24
Zinc	114	79	94	78	196	82	62	76	81

TABLE F17 (cont'd)
SUMMARY OF INORGANIC COMPOUND ANALYSES
SURFACE SOIL SAMPLES
SKINNER LANDFILL

	SS09-01	SS09-02	SS10-01	SS10-02	SS11-01	SS12-01	SS13-01
PHASE	1	1	1	1	1	1	1
CRL LOG NUMBER	86RA01S17	86RA01S18	86RA01S19	86RA01S20	86RA01S94	86RA01S95	86RA01S96
TRAFFIC REPORT NUMBER	MEJ119	MEJ120	MEJ121	MEJ122	MEJ987	MEJ988	MEJ989
DATE COLLECTED	05/01/86	05/01/86	05/01/86	05/01/86	05/01/86	05/01/86	05/01/86
UNITS	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
Aluminum	2570	2800	7830	13100	8020	9140	7600
Antimony	------	------	------	------	------	------	------
Arsenic	------	------	11	15	8	8.9	6.7
Barium	9.2	7	197	109	73	112	124
Beryllium	------	------	0.9	------	------	0.66	0.7
Cadmium	------	------	------	------	------	------	------
Calcium	210000	186000	57600	8400	88900	24900	3980
Chromium	11	6.7	13	18	11	14	11
Cobalt	------	4.1	9.7	13	7.4	11	12
Copper	16	12	39	34	23	22	16
Cyanide	------	------	------	------	------	------	------
Iron	10800	12000	61600	39700	21000	23300	17400
Lead	15	11	121	22	31	25	28
Magnesium	45600	40000	3640	4560	19400	3580	1620
Manganese	614	561	1580	1030	1020	1040	2090
Mercury	------	------	------	------	------	------	------
Nickel	10	7.9	17	30	16	16	12
Potassium	671	634	1180	1660	1650	1420	1120
Sodium	1990	1890	698	804	936	------	439
Tin	------	------	------	------	------	------	------
Vanadium	8	8	20	29	18	23	21
Zinc	108	47	329	92	116	66	63

ROUND 3 RI/FS SAMPLING

CONDUCTED IN 1987

(No sampling location map available)

WESTON DESIGNERS CONSULTANTS
100 CORPORATE NORTH, STE. 101
BANNOCKBURN, ILLINOIS 60015
312-295-6020

LETTER OF TRANSMITTAL

DATE 1/26/89	JOB NO. 130-RI1-RIRPT
ATTENTION Mr. Fred Bartman	
RE Skinner RI/FS R3.	

TO U.S. Environmental Protection Agency
230 S. Dearborn Street
Chicago, IL. 60604

WE ARE SENDING YOU ☐ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ ______

COPIES	DATE	NO.	DESCRIPTION
1	1/89		Round 3 Sampling Data Tables.

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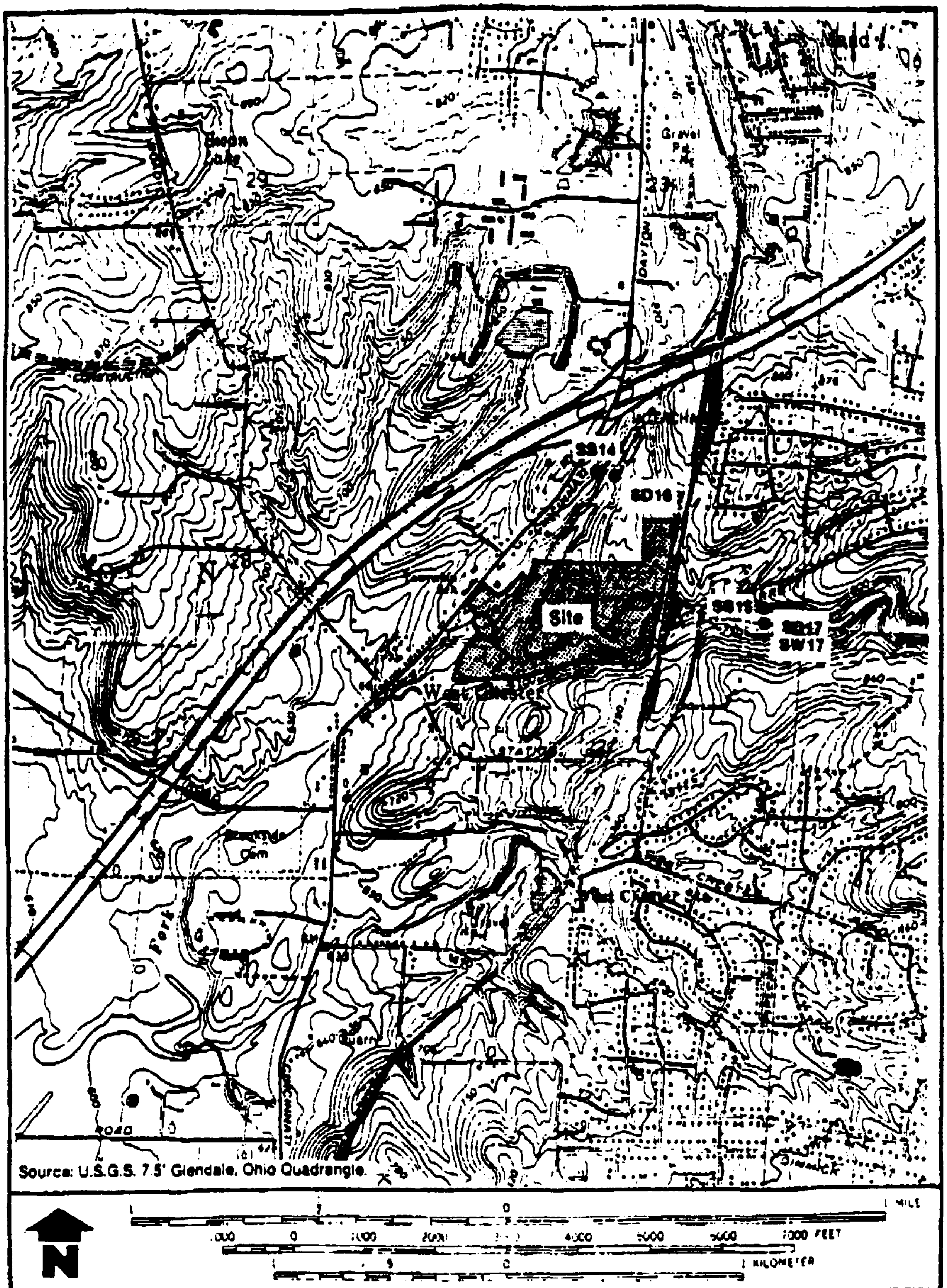

FIGURE 1 ROUND 3 SAMPLE LOCATIONS FOR SOIL, SEDIMENT AND SURFACE WATERS SKINNER LANDFILL SITE

TABLE
SUMMARY OF VOLATILE ORGANIC COMPOUND ANALYSIS
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW06-03	GW07-03	GW07-03NX	GW07-DP	GW09-03	GW10-03	GW11-03	GW12-03	GW14-03	GW15-03	GW15-BK
PHASE	3	3	3	3	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S09	87RA02S10	87RA02S10	87RA02D10	87RA02S12	87RA02S13	87RA02S14	87RA02S15	87RA02S17	87RA02S18	87RA02R18
TRAFFIC REPORT NUMBER	EN228	EN229	EN230	EN231	EN283	EN284	EN285	EN286	EN288	EN289	EN290
DATE COLLECTED	7/28/87	7/27/87	7/27/87	7/27/87	7/28/87	7/27/87	7/27/87	7/28/87	7/29/87	7/29/87	7/28/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
1,1,1-TRICHLOROETHANE	---	---	---	---	---	---	---	---	---	---	6
1,2-DICHLOROETHANE	---	---	---	---	---	---	---	---	---	---	---
2-BUTANONE	10 J/R	10 J/R	10 J/R	10 J/R	10 J/R	10 J/R	10 J/R	10 J/R	10 J/R	10 J/R	30 J/R
2-HEXANONE	---	---	---	---	---	---	---	---	---	---	---
ACETONE	10 J	10 J	1 JB	10 J	10 J	2 J	10 J	10 J	6 J	6 J	38 J
BENZENE	---	---	---	---	---	---	---	---	---	---	---
BROMOFORM	5 J	5 J	5 J	5 J	5 J	5 J	5 J	5 J	---	---	5 J
CARBON TETRACHLORIDE	---	---	---	---	---	---	---	---	3 J	---	---
CHLOROBENZENE	---	---	---	---	---	---	2 J	2 J	---	---	1 J
CHLOROMETHANE	10 J	10 J	10 J	10 J	10 J	10 J	10 J	10 J	---	---	10 J
ETHYLBENZENE	---	---	---	---	---	---	---	---	---	---	---
METHYLENE CHLORIDE	---	---	---	---	---	---	---	---	4 J	4 J	5 J
TETRACHLOROETHENE	---	---	---	---	---	---	---	---	5 J	5 J	---
TOLUENE	---	---	---	---	---	1 J	2 J	1 J	---	1 J	5
TOTAL XYLENES	---	---	---	---	---	---	---	---	---	---	---
TRANS-1,2-DICHLOROETHENE	---	10	10	10	---	---	---	---	---	---	---

J = Material Analyzed For, But Not Detected. Estimated Quantitation Limit.
R = Data Unusable, Resampling and Reanalysis Necessary for Verification
--- = No Detection

TABLE (Cont.)
SUMMARY OF VOLATILE ORGANIC COMPOUND ANALYSIS
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW16-03	GW16-DP	GW17-03	GW18-03	GW18-BK	GW19-03	GW20-03	GW21-03	GW22-03	GW23-03
PHASE	3	3	3	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S19	87RA02D19	87RA02S20	87RA02S21	87RA02R21	87RA02S22	87RA02S23	87RA02S24	87RA02S25	87RA02S26
TRAFFIC REPORT NUMBER	EN291	EN292	EN293	EN294	EN295	EN296	EN297	EN298	EN299	EN300
DATE COLLECTED	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/28/87	7/28/87	7/29/87	7/29/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.10	0.50
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
1,1,1-TRICHLOROETHANE	1 J	---	---	---	---	---	---	---	---	---
1,2-DICHLOROETHANE	---	---	---	---	---	---	---	---	4500	---
2-BUTANONE	10 J/R	10 J/R	10 J/R	10 J/R	10 J/R	10 J/R	170 J/R	10 J/R	1000 J/R	10 J/R
2-HEXANONE	---	---	---	---	---	---	---	---	740 J	---
ACETONE	2 J	---	---	---	17	---	920	10 J	4800	---
BENZENE	---	---	---	---	---	---	400	4 J	20000	---
BROMOFORM	---	---	---	---	---	---	---	5 J	---	---
CHLOROBENZENE	3 J	2 J	---	---	---	---	26 J	8	140 J	---
CHLOROMETHANE	---	---	---	---	---	---	---	10 J	---	---
ETHYLBENZENE	---	---	---	---	---	---	52 J	---	100 J	---
METHYLENE CHLORIDE	4 J	10 J	15 J	3 J	4 J	3 J	170 J	3 J	2200 J	6 J
TETRACHLOROETHENE	5 J	---	---	---	---	---	---	---	---	---
TOLUENE	---	---	---	---	---	---	3100	2 J	530	---
TOTAL XYLENES	---	---	---	---	---	---	100	---	300 J	---
TRANS-1,2-DICHLOROETHENE	---	---	---	---	---	---	31 J	---	---	---

J = Material Analyzed For, But Not Detected. Estimated Quantitation Limit.
R = Data Unusable, Resampling and Reanalysis Necessary for Verification
--- = No Detection

TABLE
SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUND ANALYSIS
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW06-03	GW07-03	GW07-03MX	GW07-DP	GW09-03	GW10-03	GW11-03	GW12-03	GW14-03	GW15-03	GW15-BK
PHASE	3	3	3	3	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S09	87RA02S10	87RA02S10	87RA02D10	87RA02S12	87RA02S13	87RA02S14	87RA02S15	87RA02S17	87RA02S19	87RA02R
TRAFFIC REPORT NUMBER	EN228	EN229	EN230	EN231	EN283	EN284	EN285	EN286	EN288	EN289	EN290
DATE COLLECTED	7/28/87	7/27/87	7/27/87	7/27/87	7/28/87	7/27/87	7/27/87	7/28/87	7/29/87	7/29/87	7/28/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
1,4-DICHLOROBENZENE	---	---	---	---	---	---	---	---	---	---	---
2,4-DINITROPHENOL	50 J	50 J	50 J	50 J	50 J	50 J	50 J	50 J	50 J	50 J	50 J
2,4-DINITROTOLUENE	---	---	---	---	---	---	---	---	---	---	---
2-METHYLPHENOL	---	---	---	---	---	---	---	---	---	---	---
4,6-DINITRO-2-METHYLPHENOL	50 J	50 J	50 J	50 J	50 J	50 J	50 J	50 J	50 J	50 J	50 J
4-METHYLPHENOL	---	---	---	---	---	---	---	---	---	---	---
4-NITROPHENOL	---	---	---	---	---	---	---	---	---	---	---
BENZOIC ACID	50 J	50 J	50 J	50 J	---	---	50 J	50 J	---	---	50 J
BENZYL ALCOHOL	---	---	---	---	---	---	---	---	---	---	---
BIS(2-CHLOROETHYL)ETHER	---	---	---	---	---	17	---	---	---	---	---
BIS(2-ETHYLHEXYL)PHTHALATE	---	---	---	3 J	---	2 J	---	---	---	---	---
DIMETHYL PHTHALATE	---	---	---	---	---	---	---	---	---	---	---
DI-N-BUTYLPHTHALATE	---	---	---	---	---	---	---	---	---	---	---
HEXACHLOROCYCLOPENTADIENE	10 J	10 J	10 J	10 J	10 J	---	10 J	10 J	10 J	---	10 J
ISOPHRONE	---	---	---	---	---	---	---	---	---	---	---
NAPHTHALENE	---	---	---	---	---	---	---	---	---	---	---
PHENOL	---	---	---	---	---	---	---	---	---	---	---

J = Material Analyzed For, But Not Detected. Estimated Quantitation Limit.
R = Data Unusable, Resampling and Reanalysis Necessary for Verification
--- = No Detection

TABLE (Cont.)
SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUND ANALYSIS
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW16-03	GW16-DP	GW17-03	GW18-03	GW18-BK	GW19-03	GW20-03	GW21-03	GW22-03	GW23-03
PHASE	3	3	3	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S19	87RA02D19	87RA02S20	87RA02S21	87RA02R21	87RA02S22	87RA02S23	87RA02S24	87RA02S25	87RA02S26
TRAFFIC REPORT NUMBER	EN291	EN292	EN293	EN294	EN295	EN296	EN297	EN298	EN299	EN300
DATE COLLECTED	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/28/87	7/28/87	7/29/87	7/29/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.10	0.50
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
1,4-DICHLOROBENZENE	---	---	7 J	3 J	---	---	3 J	---	---	---
2,4-DINITROPHENOL	50 J	50 J	50 J	50 J	50 J	50 J	50 J	---	---	100 J
2,4-DINITROTOLUENE	---	---	---	---	---	---	---	10 J	---	---
2-METHYLPHENOL	---	---	---	---	---	---	---	---	450	---
4,6-DINITRO-2-METHYLPHENOL	50 J	50 J	50 J	50 J	50 J	50 J	50 J	50 J	500 J	100 J
4-METHYLPHENOL	---	---	---	---	---	---	---	---	350	---
4-NITROPHENOL	---	---	---	---	---	---	---	---	500 J	---
BENZOIC ACID	---	50 J	---	---	50 J	---	---	---	---	---
BENZYL ALCOHOL	---	---	---	---	---	---	9 J	---	---	---
BIS(2-CHLOROETHYL)ETHER	---	---	---	---	---	---	240	---	---	---
BIS(2-ETHYLHEXYL)PHTHALATE	---	---	---	---	---	---	---	---	---	---
DIMETHYL PHTHALATE	---	---	---	---	---	---	---	---	24 J	---
DI-N-BUTYLPHTHALATE	---	---	---	---	---	---	---	---	---	5 J
HEXACHLOROCYCLOPENTADIENE	---	10 J	---	---	10 J	10 J	---	10 J	100 J	20 J
ISOPHRONE	---	---	---	---	---	---	---	---	91 J	---
NAPHTHALENE	---	---	9 J	---	---	---	64	---	---	---
PHENOL	---	---	---	---	---	---	---	---	670	---

J = Material Analyzed For, But Not Detected. Estimated Quantitation Limit.
R = Data Unusable, Resampling and Reanalysis Necessary for Verification
--- = No Detection

TABLE
SUMMARY OF PESTICIDE/PCBs ORGANIC COMPOUND ANALYSIS
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW06-03	GW07-03	GW07-03MX	GW07-DP	GW09-03	GW10-03	GW11-03	GW12-03	GW14-03	GW15-03	GW15-BK
PHASE	3	3	3	3	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S09	87RA02S10	87RA02S10	87RA02D10	87RA02S12	87RA02S13	87RA02S14	87RA02S15	87RA02S17	87RA02S19	87RA02R18
TRAFFIC REPORT NUMBER	EN228	EN229	EN230	EN231	EN283	EN284	EN285	EN286	EN288	EN289	EN290
DATE COLLECTED	7/28/87	7/27/87	7/27/87	7/27/87	7/28/87	7/27/87	7/27/87	7/28/87	7/29/87	7/29/87	7/28/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Alpha-BHC	---	---	---	---	---	---	---	---	---	---	---
Beta-BHC	---	---	---	---	---	---	---	---	---	---	---
Delta-BHC	---	---	---	---	---	---	---	---	---	---	---
Gamma-BHC	---	---	---	---	---	---	---	---	---	---	---
Heptachlor	---	---	---	---	---	---	---	---	---	---	---
Aldrin	---	---	---	---	---	---	---	---	---	---	---
Heptachlor Epoxide	---	---	---	---	---	---	---	---	---	---	---
Endosulfan I	---	---	---	---	---	---	---	---	---	---	---
Dieldrin	---	---	---	---	---	---	---	---	---	---	---
4,4-DDE	---	---	---	---	---	---	---	---	---	---	---
Endrin	---	---	---	---	---	---	---	---	---	---	---
Endosulfan II	---	---	---	---	---	---	---	---	---	---	---
4,4-DDD	---	---	---	---	---	---	---	---	---	---	---
Endrin Aldehyde	---	---	---	---	---	---	---	---	---	---	---
Endosulfan Sulfate	---	---	---	---	---	---	---	---	---	---	---
4,4-DDT	---	---	---	---	---	---	---	---	---	---	---
Methoxychlor	---	---	---	---	---	---	---	---	---	---	---
Endrin Ketone	---	---	---	---	---	---	---	---	---	---	---
Chlordane	---	---	---	---	---	---	---	---	---	---	---
Toxaphene	---	---	---	---	---	---	---	---	---	---	---
AROCLOR-1016	---	---	---	---	---	---	---	---	---	---	---
AROCLOR-1221	---	---	---	---	---	---	---	---	---	---	---
AROCLOR-1232	---	---	---	---	---	---	---	---	---	---	---
AROCLOR-1242	---	---	---	---	---	---	---	---	---	---	---
AROCLOR-1248	---	---	---	---	---	---	---	---	---	---	---
AROCLOR-1254	---	---	---	---	---	---	---	---	---	---	---
AROCLOR-1260	---	---	---	---	---	---	---	---	---	---	---

--- = No Detection

TABLE (Cont.)
SUMMARY OF PESTICIDE/PCBs ORGANIC COMPOUND ANALYSIS
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW16-03	GW16-DP	GW17-03	GW18-03	GW18-BK	GW19-03	GW20-03	GW21-03	GW22-03	GW23-03
PHASE	3	3	3	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S19	87RA02D19	87RA02S20	87RA02S21	87RA02R21	87RA02S22	87RA02S23	87RA02S24	87RA02S25	87RA02S26
TRAFFIC REPORT NUMBER	EN291	EN292	EN293	EN294	EN295	EN296	EN297	EN298	EN299	EN300
DATE COLLECTED	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/28/87	7/28/87	7/29/87	7/29/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.10	0.50
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Alpha-BHC	---	---	---	---	---	---	---	---	---	---
Beta-BHC	---	---	---	---	---	---	---	---	---	---
Delta-BHC	---	---	---	---	---	---	---	---	---	---
Gamma-BHC	---	---	---	---	---	---	---	---	---	---
Heptachlor	---	---	---	---	---	---	---	---	---	---
Aldrin	---	---	---	---	---	---	---	---	---	---
Heptachlor Epoxide	---	---	---	---	---	---	---	---	---	---
Endosulfan I	---	---	---	---	---	---	---	---	---	---
Dieldrin	---	---	---	---	---	---	---	---	---	---
4,4-DDE	---	---	---	---	---	---	---	---	---	---
Endrin	---	---	---	---	---	---	---	---	---	---
Endosulfan II	---	---	---	---	---	---	---	---	---	---
4,4-DDD	---	---	---	---	---	---	---	---	---	---
Endrin Aldehyde	---	---	---	---	---	---	---	---	---	---
Endosulfan Sulfate	---	---	---	---	---	---	---	---	---	---
4,4-DDT	---	---	---	---	---	---	---	---	---	---
Methoxychlor	---	---	---	---	---	---	---	---	---	---
Endrin Ketone	---	---	---	---	---	---	---	---	---	---
Chlordane	---	---	---	---	---	---	---	---	---	---
Toxaphene	---	---	---	---	---	---	---	---	---	---
AROCLOR-1016	---	---	---	---	---	---	---	---	---	---
AROCLOR-1221	---	---	---	---	---	---	---	---	---	---
AROCLOR-1232	---	---	---	---	---	---	---	---	---	---
AROCLOR-1242	---	---	---	---	---	---	---	---	---	---
AROCLOR-1248	---	---	---	---	---	---	---	---	---	---
AROCLOR-1254	---	---	---	---	---	---	---	---	---	---
AROCLOR-1260	---	---	---	---	---	---	---	---	---	---

--- = No Detection

TABLE
SUMMARY OF SAS PESTICIDE/PCBs ORGANIC COMPOUND ANALYSIS
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW06-03	GW07-03	GW07-03MX	GW09-03	GW10-03	GW11-03	GW12-03	GW14-03	GW15-03	GW15-BK
PHASE	3	3	3	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S09	87RA02S10	87RA02S10	87RA02S12	87RA02S13	87RA02S14	87RA02S15	87RA02S17	87RA02S18	87RA02R18
TRAFFIC REPORT NUMBER	EN228	EN229	EN230	EN283	EN284	EN285	EN286	EN288	EN289	EN290
DATE COLLECTED	7/28/87	7/27/87	7/27/87	7/28/87	7/27/87	7/27/87	7/28/87	7/29/87	7/29/87	7/28/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Hexachlorobenzene	---	---	---	---	---	---	---	---	---	---
Hexachlorocyclopentadiene	---	---	---	---	---	---	---	---	---	---
Hexachlorobutadiene	---	---	---	---	---	---	---	---	---	---
Hexachloronorboradiene	---	---	---	---	---	---	---	---	---	---
Octachlorocyclopentene	---	---	---	---	---	---	---	---	---	---
Heptachloronorborene	---	---	---	---	---	---	---	---	---	---
Alpha-Chlordene	---	---	---	---	---	---	---	---	---	---
Beta-Chlordene	---	---	---	---	---	---	---	---	---	---
Gamma-Chlordene	---	---	---	---	---	---	---	---	---	---

--- = Not Detected

TABLE (Cont.)
SUMMARY OF SAS PESTICIDE/PCBs ORGANIC COMPOUND ANALYSIS
GROUNDWATER SAMPLES
SKINNER LANDFILL

	GW16-03	GW16-DP	GW17-03	GW18-03	GW18-BK	GW19-03	GW20-03	GW21-03	GW22-03
PHASE	3	3	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S19	87RA02D19	87RA02S20	87RA02S21	87RA02R21	87RA02S22	87RA02S23	87RA02S24	87RA02S25
TRAFFIC REPORT NUMBER	EN291	EN292	EN293	EN294	EN295	EN296	EN297	EN298	EN299
DATE COLLECTED	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/28/87	7/28/87	7/29/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.10
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Hexachlorobenzene	---	---	---	---	---	---	---	---	---
Hexachlorocyclopentadiene	---	---	---	---	---	---	---	---	---
Hexachlorobutadiene	---	---	---	---	---	---	---	---	---
Hexachloronorboradiene	---	---	---	---	---	---	---	---	---
Octachlorocyclopentene	---	---	---	---	---	---	---	---	---
Heptachloronorborene	---	---	---	---	---	---	---	---	---
Alpha-Chlordene	---	---	---	---	---	---	---	---	---
Beta-Chlordene	---	---	---	---	---	---	---	---	---
Gamma-Chlordene	---	---	---	---	---	---	---	---	---

--- = Not Detected

TABLE
SUMMARY OF INORGANIC AND CYANIDE COMPUND ANALYSIS
GROUNDWATER AND SURFACE WATER SAMPLES
SKINNER LANDFILL

	GW07-03	GW07-DP	GW12-03	GW15-03	GW15-BK	GW20-03	SW17-01
PHASE	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S10	87RA02D10	87RA02S15	87RA02S18	87RA02R18	87RA02S23	87RA02S08
TRAFFIC REPORT NUMBER	MEN037	MEN039	MEN040	MEN041	MEN042	MEN043	MEN038
DATE COLLECTED	7/27/87	7/27/87	7/28/87	7/29/87	7/28/87	7/28/87	7/29/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Aluminum	96 J	23 J	20 J	---	19 J	---	502
Antimony	---	---	---	---	---	---	---
Arsenic	---	---	---	---	---	48	---
Barium	101 J	97 J	73 J	85 J	---	597	46 J
Beryllium	---	---	---	---	---	---	---
Cadmium	---	---	---	---	---	---	---
Calcium	13600	133000	239000	164000	232 J	195000	69200
Chromium	---	---	---	---	---	---	---
Cobalt	---	---	9.3 J				
Copper	6.2 J	8.3 J	10 J	6.9 J	---	---	7 J
Iron	49 J	---	35 J	24 J	---	31600	872
Lead	---	---	---	---	---	---	---
Magnesium	22000	20900	83100	33800	---	51600	20100
Manganese	484	466	3490	2280	---	1150	35
Mercury	---	---	---	---	---	---	---
Nickel	---	---	38 J	8.7 J	---	20 J	---
Potassium	1610 J	1350	34700	8410	---	41500	3920 J
Selenium	---	---	---	---	---	---	---
Silver	---	---	---	---	---	---	---
Sodium	29600	30000	158000	76400	---	81200	19400
Thallium	---	---	---	---	---	---	---
Tin	---	---	---	---	---	---	---
Vanadium	---	---	---	---	---	---	---
Zinc	25	22	10 J	5.4 J	3.9 J	12 J	7.2 J
Cyanide	---	---	---	---	---	---	---

J = Estimated Value
--- = Not Detected
GW = Groundwater
SW = Surface Water

TABLE
SUMMARY OF VOLATILE ORGANIC COMPOUND ANALYSIS
SOIL AND SURFACE WATER SAMPLES
SKINNER LANDFILL

	SS14-01	SS14-DP	SS14-02	SS15-01	SS15-01	SS15-02	SD16-01	SD17-01	SW17-01
PHASE	3	3	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S01	87RA02D01	87RA02S02	87RA02S03	87RA02S03	87RA02S04	87RA02S05	87RA02S06	87RA02S08
TRAFFIC REPORT NUMBER	EM077	EM078	EM079	EM080	EM081	EN223	EN224	EN225	EN227
DATE COLLECTED	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
CHLOROMETHANE	12 J	12 J	12 J	14 J	14 J	13 J	13 J	11 J	---
METHYLENE CHLORIDE	4 J	5 J	7 J	6 J	5 J	7 J	9 J	7 J	5 J
2-BUTANONE	12 J/R	12 J/R	12 J/R	14 J/R	14 J/R	13 J/R	13 J/R	11 J/R	10 J/R
1,1,1-TRICHLOROETHANE	23	9	---	25	24	---	10	---	---
4-METHYL-2-PENTANONE	12 J	12 J	---	14 J	14 J	---	---	---	---
TOLUENE	17	12	39	---	---	3 J	---	---	---
TETRACHLOROETHENE	---	---	---	---	---	---	---	---	5 J
ACETONE	---	---	---	---	---	---	---	---	4 J

J = Material Analyzed For, But Not Detected. Estimated Quantitation Limit.
R = Data Unusable, Resampling and Reanalysis Necessary for Verification
--- = No Detection
SS = Surface Soil
SD = Sediment
SW = Surface Water

TABLE
SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUND ANALYSIS
SOIL AND SURFACE WATER SAMPLES
SKINNER LANDFILL

	SS14-01	SS14-DP	SS14-02	SS15-01	SS15-01	SS15-02	SD16-01	SD17-01	SW17-01
PHASE	3	3	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S01	87RA02D01	87RA02S02	87RA02S03	87RA02S03	87RA02S04	87RA02S05	87RA02S06	87RA02S08
TRAFFIC REPORT NUMBER	EM077	EM078	EM079	EM080	EM081	EN223	EN224	EN225	EN227
DATE COLLECTED	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
BENZOIC ACID	2900 J	3000 J	2900 J	3400 J	3400 J	3000 J	3200 J	2700 J	---
HEXACHLOROCYCLOPENTADIENE	590 J	620 J	590 J	710 J	690 J	620 J	660 J	560 J	10 J
2-NITROANILINE	2900 J	3000 J	2900 J	3400 J	3400 J	3000 J	3200 J	2700 J	---
BUTYLBENZYLPHTHALATE	73 J	620 J	590 J	710 J	690 J	620 J	660 J	560 J	---
BIS(2-ETHYLHEXYL)PHTHALATE	590 J	620 J	590 J	200 J	690 J	620 J	660 J	560 J	---
INDENO(1,2,3-CD)PYRENE	590 J	620 J	590 J	710 J	690 J	620 J	660 J	560 J	---
DIBENZ(a,h)ANTRACENE	590 J	620 J	590 J	710 J	690 J	620 J	660 J	560 J	---
BENZO(g,h,i)PERYLENE	590 J	620 J	590 J	710 J	690 J	620 J	660 J	560 J	---
2,4-DINITROPHENOL	---	---	---	---	---	---	---	---	50 J
4,6-DINITRO-2-METHYLPHENOL	---	---	---	---	---	---	---	---	50 J

J = Material Analyzed For, But Not Detected. Estimated Quantitation Limit.
R = Data Unusable, Resampling and Reanalysis Necessary for Verification
--- = No Detection
SS = Surface Soil
SD = Sediment
SW = Surface Water

TABLE
SUMMARY OF PESTICIDE/PCBs ORGANIC COMPOUND ANALYSIS
SOIL AND SURFACE WATER SAMPLES
SKINNER LANDFILL

	SS14-01	SS14-DP	SS14-02	SS15-01	SS15-01	SS15-02	SD16-01	SD17-01	SW17-01
PHASE	3	3	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S01	87RA02D01	87RA02S02	87RA02S03	87RA02S03	87RA02S04	87RA02S05	87RA02S06	87RA02S08
TRAFFIC REPORT NUMBER	EM077	EM078	EM079	EM080	EM081	EN223	EN224	EN225	EN227
DATE COLLECTED	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
Alpha-BHC	---	---	---	---	---	---	---	---	---
Beta-BHC	---	---	---	---	---	---	---	---	---
Delta-BHC	---	---	---	---	---	---	---	---	---
Gamma-BHC	---	---	---	---	---	---	---	---	---
Heptachlor	---	---	---	---	---	---	---	---	---
Aldrin	---	---	---	---	---	---	---	---	---
Heptachlor Epoxide	---	---	---	---	---	---	---	---	---
Endosulfan I	---	---	---	---	---	---	---	---	---
Dieldrin	---	---	---	---	---	---	---	---	---
4,4-DDE	---	---	---	---	---	---	---	---	---
Endrin	---	---	---	---	---	---	---	---	---
Endosulfan II	---	---	---	---	---	---	---	---	---
4,4-DDD	---	---	---	---	---	---	---	---	---
Endrin Aldehyde	---	---	---	---	---	---	---	---	---
Endosulfan Sulfate	---	---	---	---	---	---	---	---	---
4,4-DDT	---	---	---	---	---	---	---	---	---
Methoxychlor	---	---	---	---	---	---	---	---	---
Endrin Ketone	---	---	---	---	---	---	---	---	---
Chlordane	---	---	---	---	---	---	---	---	---
Toxaphene	---	---	---	---	---	---	---	---	---
AROCLOR-1016	---	---	---	---	---	---	---	---	---
AROCLOR-1221	---	---	---	---	---	---	---	---	---
AROCLOR-1232	---	---	---	---	---	---	---	---	---
AROCLOR-1242	---	---	---	---	---	---	---	---	---
AROCLOR-1248	---	---	---	---	---	---	---	---	---
AROCLOR-1254	---	---	---	---	---	---	---	---	---
AROCLOR-1260	---	---	---	---	---	---	---	---	---

--- = No Detection SD = Sediment
SS = Surface Soil SW = Surface Water

TABLE
SUMMARY OF SAS PESTICIDE/PCBs ORGANIC COMPOUND ANALYSIS
SOIL AND SURFACE WATER SAMPLES
SKINNER LANDFILL

	SS14-01	SS14-DP	SS14-02	SS15-01	SS15-01	SS15-02	SD16-01	SD17-01	SW17-01
PHASE	3	3	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S01	87RA02D01	87RA02S02	87RA02S03	87RA02S03	87RA02S04	87RA02S05	87RA02S06	87RA02S08
TRAFFIC REPORT NUMBER	EH077	EH078	EH079	EH080	EH081	EH223	EH224	EH225	EH227
DATE COLLECTED	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
Hexachlorobenzene	---	---	---	---	---	---	---	---	---
Hexachlorocyclopentadiene	---	---	---	---	---	---	---	---	---
Hexachlorobutadiene	---	---	---	---	---	---	---	---	---
Hexachloronorboradiene	---	---	---	---	---	---	---	---	---
Octachlorocyclopentene	---	---	---	---	---	---	---	---	---
Heptachloronorborene	---	---	---	---	---	---	---	---	---
Alpha-Chlordene	---	---	---	---	---	---	---	---	---
Beta-Chlordene	---	---	---	---	---	---	---	---	---
Gamma-Chlordene	---	---	---	---	---	---	---	---	---

--- = No Detection
SS = Surface Soil
SD = Sediment
SW = Surface Water

TABLE
SUMMARY OF INORGANIC AND CYANIDE COMPOUND ANALYSIS
SEDIMENT SAMPLES
SKINNER LANDFILL

	SS14-01	SS14-02	SS14-DP	SS15-01	SS15-01	SS15-02	SD16-01	SD17-01
PHASE	3	3	3	3	3	3	3	3
CRL LOG NUMBER	87RA02S01	87RA02S02	87RA02D01	87RA02S03	87RA02S03	87RA02S04	87RA02S05	87RA02S06
TRAFFIC REPORT NUMBER	MEN792	MEN794	MEN793	MEN795	MEN796	MEN797	MEN798	MEN799
DATE COLLECTED	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87	7/29/87
CONC/DIL FACTOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UNITS	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
Aluminum	9320	11700	9350	9790	10400	9510	8070	5960
Antimony	---	---	---	---	---	---	---	---
Arsenic	6.8	11	8.8	8.1	9.3	8	8.8	9
Barium	111 J	116	101 J	101 J	106 J	172	93 J	327
Beryllium	0.83 J	0.94 J	0.84 J	0.8 J	---	0.87	---	0.65 J
Cadmium	---	---	---	---	---	---	---	---
Calcium	15200	15500	13900	27400	23300	36900	61600	109000
Chromium	15	17	14	15	16	14	13	10
Cobalt	8.6 J	12 J	9.8 J	9.8 J	9.2 J	12 J	11 J	10 J
Copper	17	19	17	24	22	18	19	14
Iron	23100	25700	21500	23800	24800	24300	21500	23900
Lead	25	18	29	39	42	27	32	13
Magnesium	2790 J	3300	2830	3890	3740	3170	6040	14900
Manganese	1420	1390	1280	1630	1670	2570	1810	3310
Mercury	---	---	0.14	---	0.23	---	---	10
Nickel	21 J	25	22 J	22 J	23 J	24 J	22 J	26
Potassium	1020 J	1170 J	1100 J	1820	1720 J	1460 J	1090 J	740 J
Selenium	---	---	---	---	---	---	---	---
Silver	---	---	---	---	---	---	---	---
Sodium	29600	698 J	---	---	---	---	---	---
Thallium	---	---	---	---	---	---	---	---
Tin	---	---	---	---	---	---	---	---
Vanadium	22 J	26 J	21 J	24 J	24 J	24 J	20 J	23 J
Zinc	65	65	69	90	89	63	109	52
Cyanide	---	---	---	---	---	---	---	---
Percent Solids	85	87	84	74	73	81	74	90

J = Estimated Value   SS = Surface Soil   SW = Surface Water
--- = Not Detected   SD = Sediment

SOIL GAS SURVEY

REM II REMEDIAL RESPONSE TEAM

TO: Mr. Gene Wong

DATE: 5/12/87

SITE NAME: Skinner

SITE NUMBER: 130

FROM: A M Bort

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SOIL GAS SURVEY

Purpose and Scope

A soil gas survey was conducted at the Skinner Landfill site from April 6 to April 10, 1987. The initial purpose of the soil gas survey was to expand on the previously conducted geophysical survey by exploring locations with anomalous readings in the central shoulder area that were possible buried drum nests. Further, the buried lagoon area was to be surveyed to determine the areas of highest contaminant concentration. The results of the soil gas survey were then to be correlated with the geophysical results to develop a soil boring program to further characterize the areas of potential contamination.

The initial scope of work called for the installation of approximately 150 soil probes in the study area which consisted of the central shoulder and bured lagoon areas of the site. The probes were to be placed in predetermined locations on the existing site grid system utilized for the geophysical survey. In this manner, the two surveys could be correlated to achieve the stated purpose.

Theory

The instrument used for the soil gas survey was the Miran 1B Portable Ambient Air Analyzer. The Miran 1B is a microprocessor-controlled instrument that can detect and quantitatively measure over 100 compounds at concentrations from a few ppb to the percent range. The instrument is a portable ambient air analyzer that can be used to quantitatively measure to within ± 5 ppm a wide variety of organic vapors. The concentration of organic vapors present is measured by using the principle of infrared absorption. The principle of operation, as stated in the operating manual, is:

> Infrared energy is emitted from a nichrome wire source through a light pipe assembly. The light is then directed to the filter wheel that allows energy at the selected wave-length to pass through into the gas cell. The sample is drawn into the cell by the integral air pump at a rate of 25 to 30 litres per minute. The sample absorbs infrared energy from the beam, and the amount of absorption is measured by the detector, amplified and converted to concentration units by the electronics, and transmitted to the liquid crystal display. The amount of infrared radiation absorbed by a sample is directly related to the concentration of the sample according to Beer's Law:
>
> $$A = a \times b \times c$$
>
> where A is absorbance, a is the absorbtivity constant, b is the pathlength, and c is the concentration. The MIRAN 1B also incorporates a curve correction term to correct for any deviations from Beer's Law.

Three compounds were chosen for the soil gas survey based on frequency of occurrence and concentration determined from the Phase 1 analytical results. These compounds included benzene, methylene chloride and toluene. Because the Miran 1B tests for one compound at a time to calculate a specific concentration, there is little chance for any type of interference. Interference could occur in the analysis of two compounds with absorption wavelengths within 0.5 microns. The wavelengths for benzene, methylene chloride, and toluene are 9.93, 13.47, and 13.89 microns, respectively. There would be no interference effects from toluene and methylene chloride in the measurement of benzene. The possibility for interference between methylene chloride and benzene does exist, however, based on the results, there does not appear to have been interference. This is discussed further in the Survey Results section. Other compounds with wavelengths within 0.5 microns of the compounds being analyzed could also interfere with the results. Compounds with wavelengths within 0.5 microns of benzene, methylene chloride, or toluene that could be present at the Skinner Landfill site are given in Table 1.

The instrument takes readings continuously (once every 2 seconds) and for this survey, readings were recorded once every 30 seconds. The absorption wavelengths of three compounds measured in this survey are included in the pre-programmed library of the instrument. Therefore, no precalibration for this study was needed.

Field Program

Upon arrival at the site, it was discovered that the majority of the proposed study area had been covered with 5 to 20 feet of demolition debris and solid waste. The fill had covered both the existing site grid system and the proposed soil probe locations. This necessitated a revision in the anticipated scope of work.

The southern-most portion of the central shoulder and buried lagoon areas were covered with fill to a maximum thickness of approximately 10 feet. It was decided by the U.S. EPA RPM and the WESTON Site Manager to conduct the soil gas survey in this area. A grid system to locate the soil probes was constructed utilizing existing monitoring wells on site. The location of this grid system is shown in Figure 1.

A total of 19 soil probes were placed within the grid system and the locations are shown in Figure 2.

The soil probes were 5 feet long and 1/2 inch in diameter with 3-inch pointed tips. The bottom one foot of each probe was slotted to allow air ~~an~~ entry. The top of each probe had a threaded cap. Figure 3 contains a schematic diagram of the probes.

Because the probes had to be placed in the soil below the recent fill to accurately assess the amount of contamination present, 5-foot extenders with threaded ends were constructed to increase the length of the probes. When the extenders, which also had threaded caps, were attached, the probes were long enough to penetrate the soil below the recent fill.

TABLE 1

POSSIBLE INTERFERENCE COMPOUNDS PRESENT AT THE SKINNER LANDFILL SITE

Compound	Wavelength
m-dichlorobenzene	9.47
o-dichlorobenzene	13.55
p-dichlorobenzene	9.30
ethylbenzene	9.90
xylene	13.20

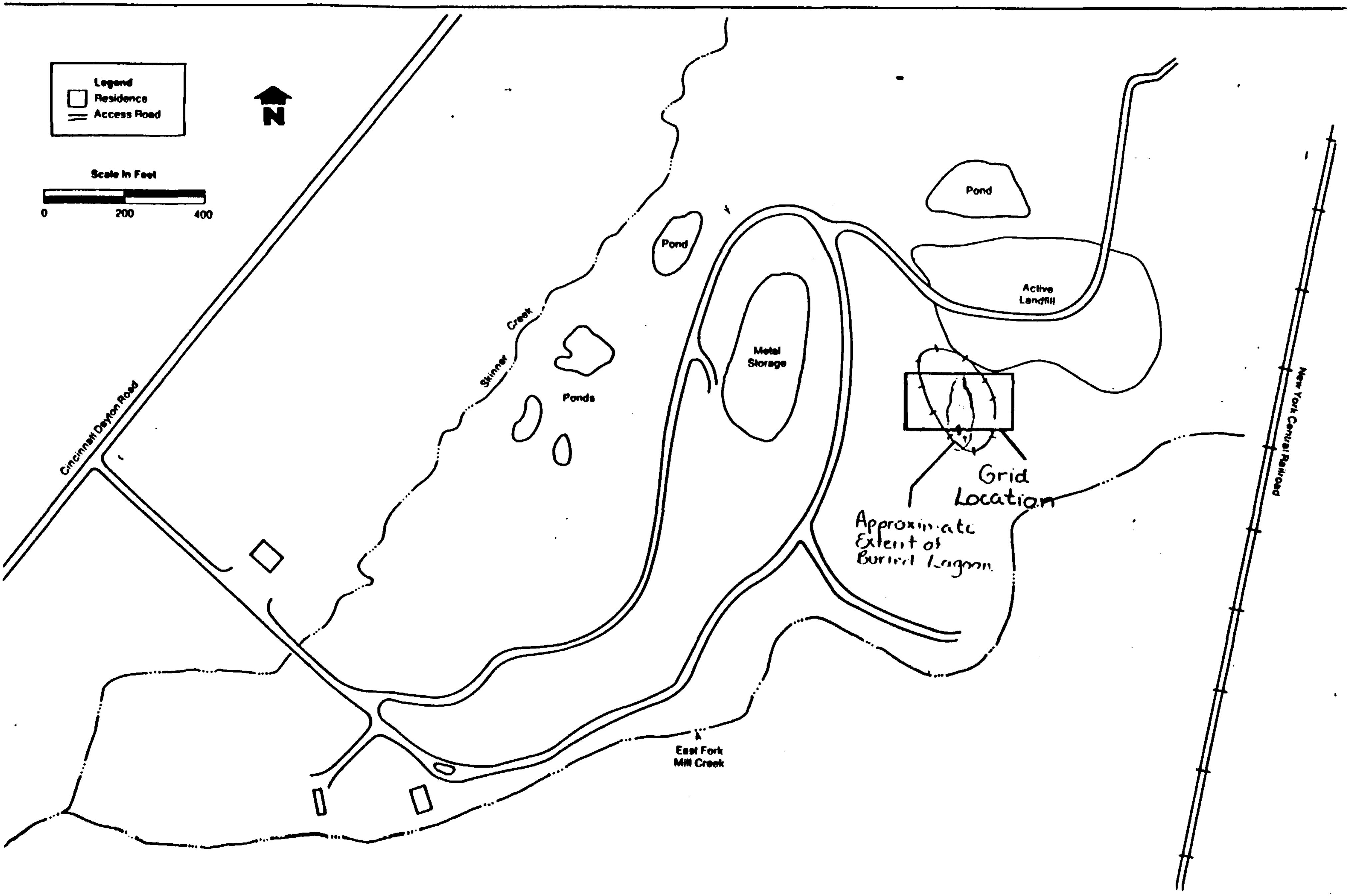

FIGURE LOCATION OF SOIL SURVEY GRID ON SITE.

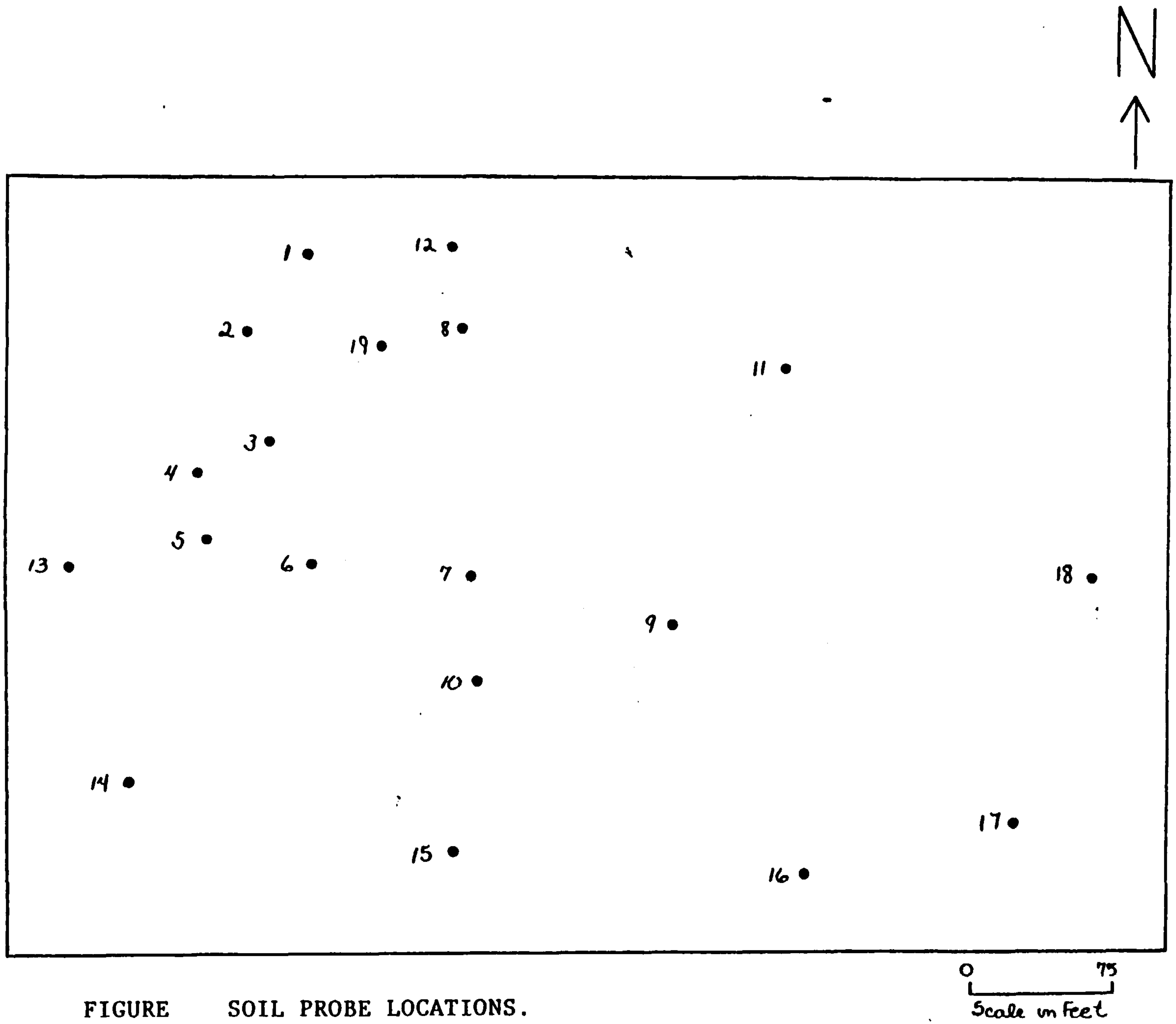

FIGURE SOIL PROBE LOCATIONS.

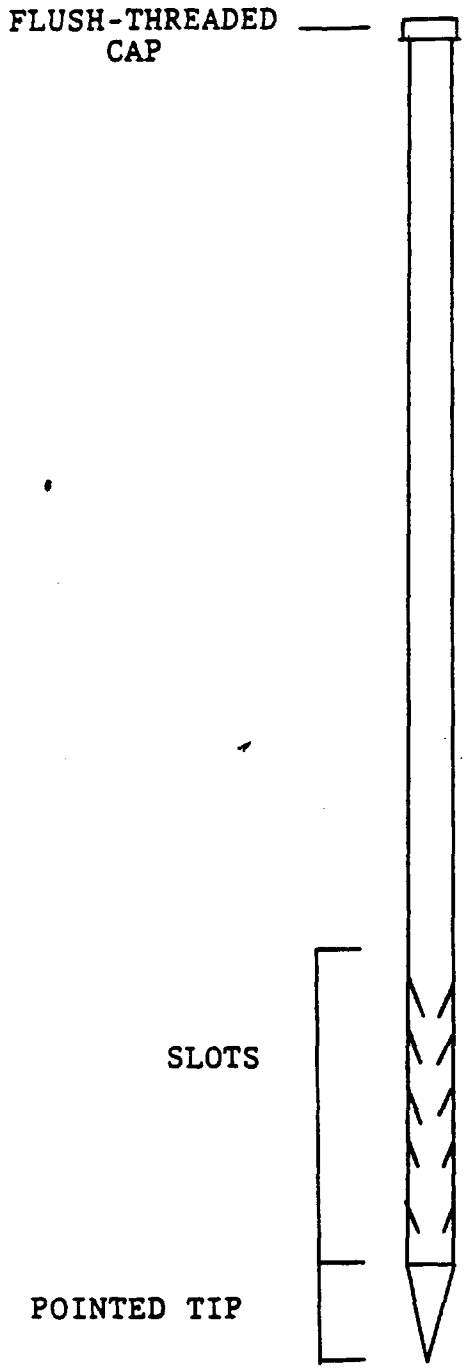

FIGURE DIAGRAM OF SOIL PROBE USED AT THE SKINNER LANDFILL SITE.

Prior to installation, each probe and extender was washed with a water and Alconox solution and rinsed first with methonal and then de-ionized water. After placement to a depth of approximately 9.5 feet, the probes were capped and allowed to stabilize for 24 hours. Before use each day, the instrument was taken off site to obtain a background concentration for the compound being analyzed. The ambient air concentration of the compound being measured was also recorded at each probe location prior to attachment to the probe.

Tygon tubing was attached to the instrument, the probe was uncapped, and the tubing was attached to the probe. Then, measurements of the concentrations were recorded once every 30 seconds until readings stabilized. Stabilization usually occurred within four to five minutes. Table 2 summarizes these results for each compound. The measurements for methylene chloride were obtained at all probes first. The probe was then recalibrated to background and measurements for benzene were taken. Toluene was the third compound tested for at the probes.

Discussion of Results

The stabilized results of the soil gas readings are plotted on the maps in Figures 3, 4, and 5. Concentrations of methylene chloride ranged from 2.2 to 868 ppm, benzene from 1.2 to 50 ppm, and toluene from 1.7 to 768 ppm. There does not appear to be any trend to the data, rather there appears to be a series of "hot spots" where one or more of the compounds was detected at high concentrations.

Because the range of concentrations of methylene chloride were 10 to 30 times higher than the concentrations of benzene, there appears to be no interference (discussed in the "Theory" section) between the two compounds. The interference usually occurs at concentrations less than 10 ppm, therefore, the concentrations are most likely accurate. Also based on the consistency of results, the higher (>10 ppm) concentrations of most readings, and the accuracy of the instrument, the readings are probably correct to within ± 5 ppm.

The areas of highest concentration of one or more compounds occur in the northwest and west portion of the survey area, in the area of the buried lagoon, and there are also some scattered "hot spots" in the north-central and central areas of the survey.

The results of the soil gas survey were correlated to the results of the geophysical survey conducted previously by overlaying the two grid systems. This correlation indicated that several areas of contamination are indicated by both surveys. Probes 1, 2, 3, and 8 are located in one area of high conductivity and Probes 7, 9 and 10 are in another, as indicated by the EM survey. Probes 8 and 9 are also located in areas that were determined to be possible drum nests by the GPR survey.

By utilizing these correlated results, the proposed test trench locations, to further characterize the contamination present are presented in Figure 7.

TABLE 2
SKINNER LANDFILL SOIL GAS PROBE DATA
METHYLENE CHLORIDE (in ppm)

PROBE:	1D	1D DUP	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
INITIAL TIME:	8:35	12:24	8:44	8:53	9:00	9:05	9:11	9:19	9:31	9:39	9:51	9:58	10:09	10:18	10:31	10:40	11:38	11:45	11:52	12:02
BACKGROUND:	10	-0.5	14	18	14	15	11	13	12	18	15	15	14	19	19	20	0.2	-3	-2.1	-0.5
TIME (min)																				
0.0	10	-0.5	14	18	14	15	12	13	10	140	15	15	14	20	19	20	0.2	-3	-2.1	-0.5
0.5	464	220	12	19	27	9.2	93	33	288	188	115	64	74	22	351		21	-4	8.4	2.4
1.0	620	527	9.4		39					214	169	84	139		480	23	34	-1	9.4	2.2
1.5	623	663	8.4	18	42	9.5	133	152	382	219	186	87	160	240	508	24	39	-0.8	8.1	0
2.0	623	739	5.1	18	42	13	144	229	413	228	191	90	168	353	524	45	44	-0.2	7.5	
2.5	642	784	8.4	17	42	12	148	257	432	231	192	91	172	368	531	65	49			
3.0	652	817	8.3	19	41	12	152	266	445	234	194	92	172	550	534	84	49			
3.5	656	838					154	272	454	238	195	92	173	617	537	100				
4.0	657	841					155	274	462	241	194		175	692	538	120				
4.5	658	845					156	275	464	242			175	715	538	138				
5.0							155	274	463	243			174	754		150				
5.5										242				788		161				
6.0														801		170				
6.5														823		179				
7.0														841		188				
7.5														854		194				
8.0														868		200				
8.5																207				
9.0																211				

NOTES

INITIAL TIME indicates time analysis of gas from probe commenced.
All analysis for methylene chloride were completed on 04/08/87.
D indicates deep soil gas probe.
DUP indicates duplicate sampling and analysis.

TABLE 2 (con't)
SKINNER LANDFILL SOIL GAS PROBE DATA
TOLUENE (in ppm)

PROBE:	1D	1S	2D	2S	3D	3S	4	5D	5S	6	7	8	9	10	11	13S
INITIAL TIME:	10:51	11:03	11:28	11:32	11:37	11:41	12:05	11:46	11:48	12:10	12:14	11:09	12:19	12:24	12:29	11:54
BACKGROUND:	0	2.5	1.2	1.4	2.2	16	1.5	2.5	3	2.9	0.4	1.3	4.5	4	2.5	0.9
TIME (min)																
0.0	-0.2	2.5	1.2	1.4	2.2	16	1.5	2.5	3	2.9	0.4	1.3	4.5	4	2.5	0.9
0.5	1.6	94	0.2	363	1.1	650	41	2.7	40	97	130	222	140	98	38	2.8
1.0	105	127	0.7	517	1.1	755	46	3.2	51	128	168	310	189	122	46	89
1.5	179	140	1	562	0.7	765	49	4.3	56	140	179	339	203	133	52	211
2.0	253	145	0.9	569	1.2	768	47	3.4	59	146	186	354	212	139	54	277
2.5	306	148	1	570	0.8	769	47		61	149	188	361	216	141	55	330
3.0	348	148	1.7	568		768			61	149	189	361	218	141	54	401
3.5	385	149										366	221	141	52	451
4.0	410											367	218		50	497
4.5	433														49	537
5.0	451															567
5.5	467															594
6.0	481															617
6.5	492															640
7.0	500															658
7.5	506															673
8.0	515															687
8.5	519															695
9.0	524															704
9.5	527															715
10.0	531															725
10.5	534															

NOTES

INITIAL TIME indicates time analysis of soil gas using probe commenced.
All analysis for toluene were completed on 04/09/87.

TABLE 2 (con't)
SKINNER LANDFILL SOIL GAS PROBE DATA
BENZENE (in ppm)

PROBE:	1D	1S	2D	2S	3D	3S	4	5D	5S	6	7	8	9	10 CF	10 PF	11	19D	19S
INITIAL TIME:	8:41	8:51	8:57	9:02	9:08	9:13	9:18	9:43	9:50	9:55	10:00	9:23	10:06	10:12	10:18	10:24	9:31	9:35
BACKGROUND:	4.5	-0.5	-0.3	-1.5	0.8	1.2	3.1	3.5	5.1	5.2	6.8	1.1	5.2	4.9	4.9	4.2	3.3	2.4
TIME (min)																		
0.0	2.4	-0.5	-0.3	-1.5	0.8	1.2	3.1	3.5	5.1	5.2	6.8	1.1	5.2	4.9	5	4.2	3.3	2.4
0.5	-0.9	1.5	0.1	17	3.2	24	6.3	5.1	7.5	7.4	12	8.2	9.5	9.3	12	9.3	5.5	9.6
1.0	-0.6	5.6	0.2	26	3.3	34	9.7	6.7	11	13	16	13	12	11	14	12	7.9	19
1.5	0.9	7	0.3	29	3.3	40	10	8.6	11	15	17	18	14	13	15	12	8.6	25
2.0	3.2	7.6	0.4	31	3.3	43	11	9	13	16	19	20	16	15	15	12	9.8	28
2.5	10.9	9	1.1	31	3.5	44	11	9.5	13	16	20	22	17	16	15	13	10	31
3.0	12	10	1.2	32	3	44	12	9.3	14	17	20	23	17	16	15	12	10	32
3.5	17	11	0.7					9.9			21	23	19					33
4.0	22	11						10			21	23	19					34
4.5	27											24						
5.0	30											23						
5.5	35																	
6.0																		
6.5	44																	
7.0	46																	
7.5	50																	
8.0																		
8.5																		
9.0																		

NOTES

INITIAL TIME indicates time analysis of soil gas using probe commenced.
All analysis for benzene were completed on 04/09/87.
S indicates shallow probe, D indicates deep soil gas probe.
CF indicates cotton filter, PF indicates paper filter.

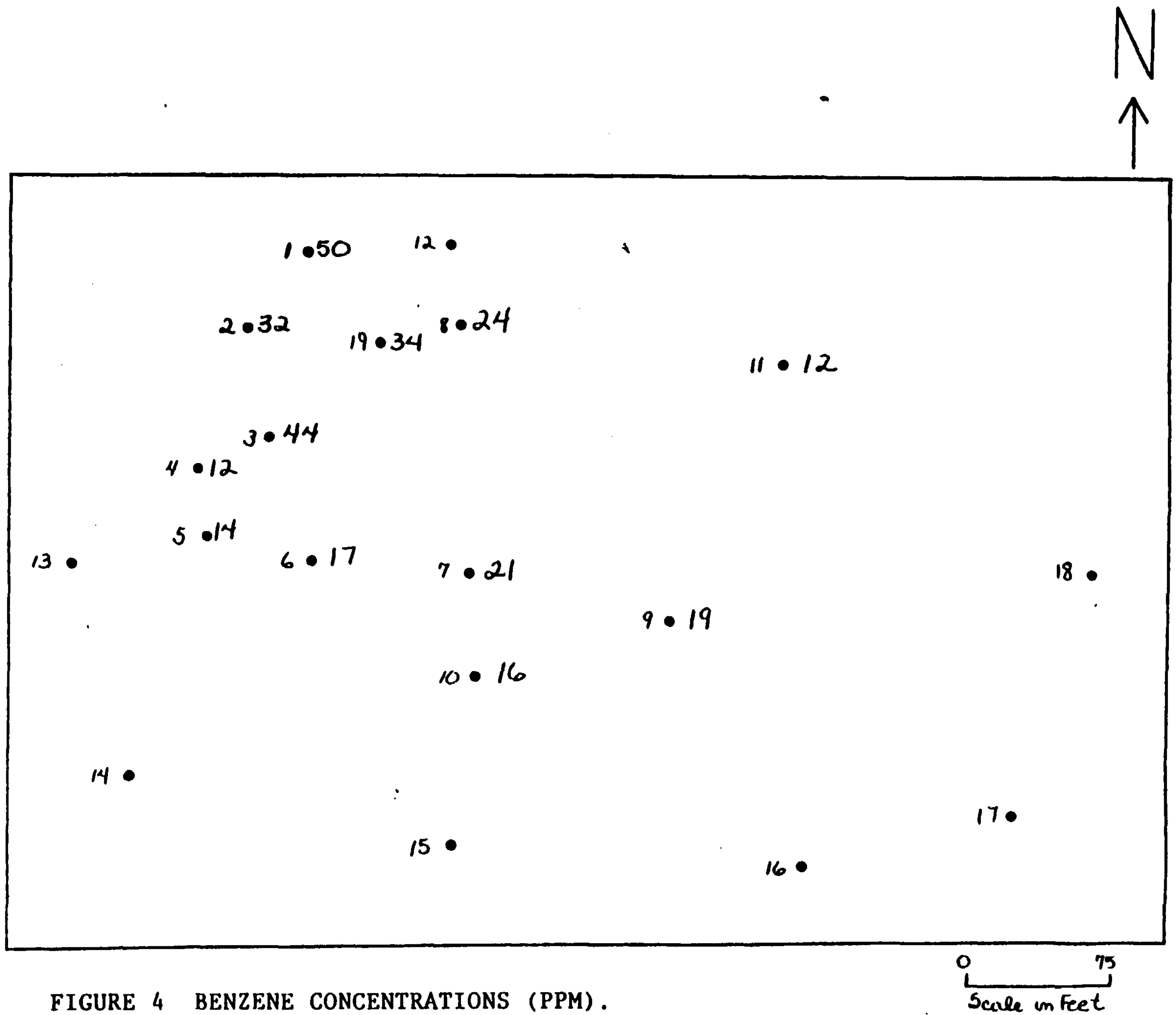

FIGURE 4 BENZENE CONCENTRATIONS (PPM).

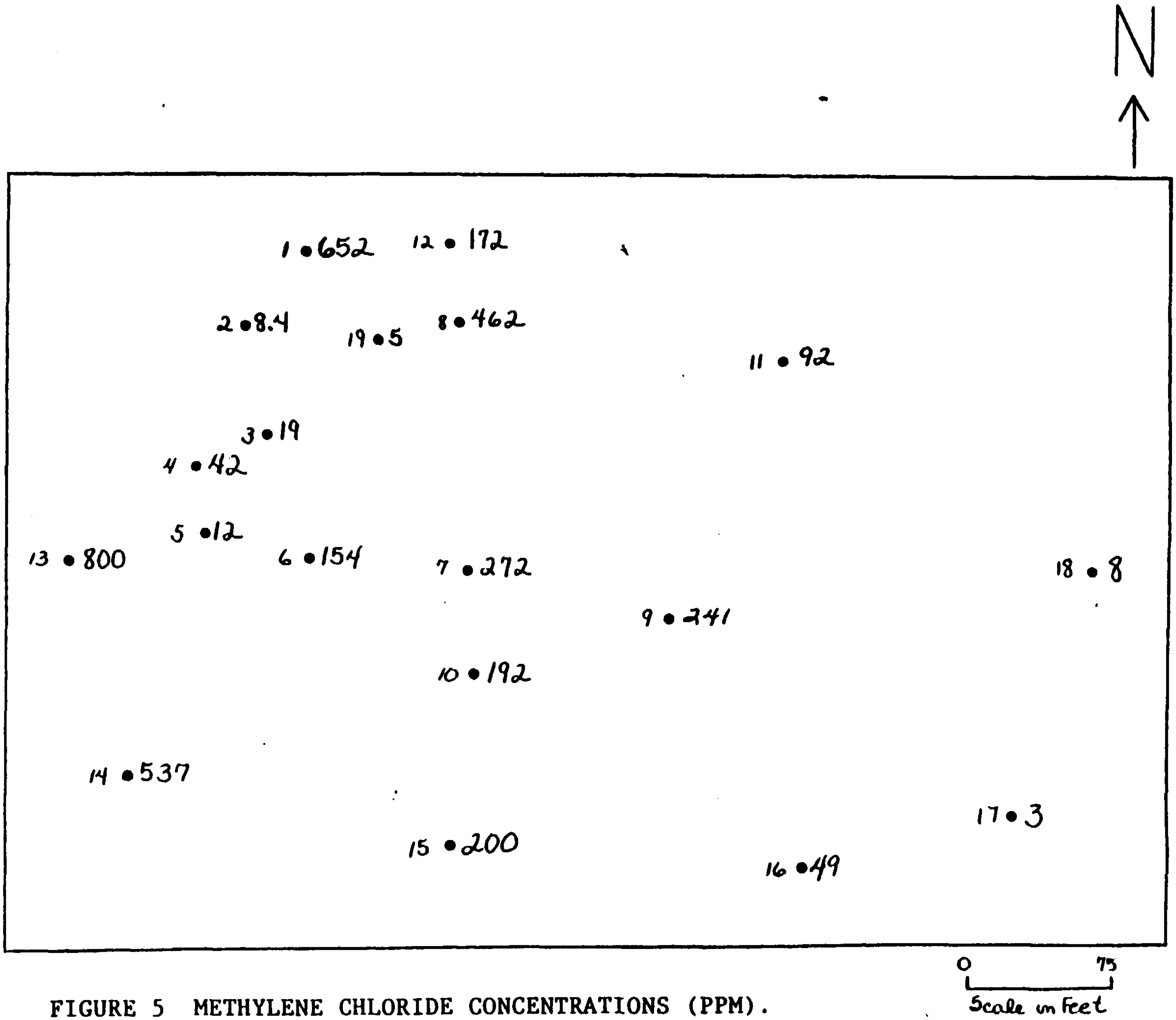

FIGURE 5 METHYLENE CHLORIDE CONCENTRATIONS (PPM).

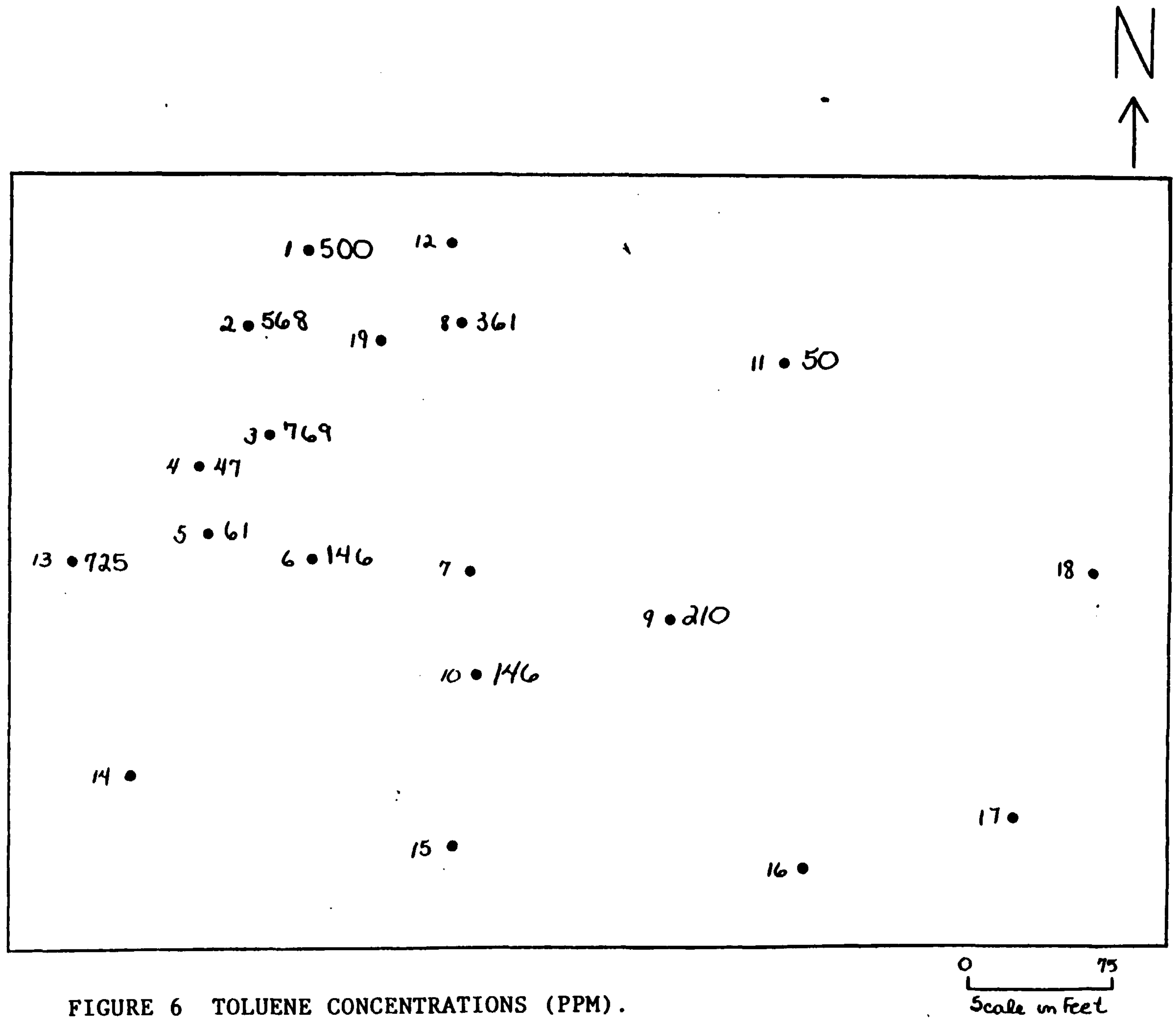

FIGURE 6 TOLUENE CONCENTRATIONS (PPM).

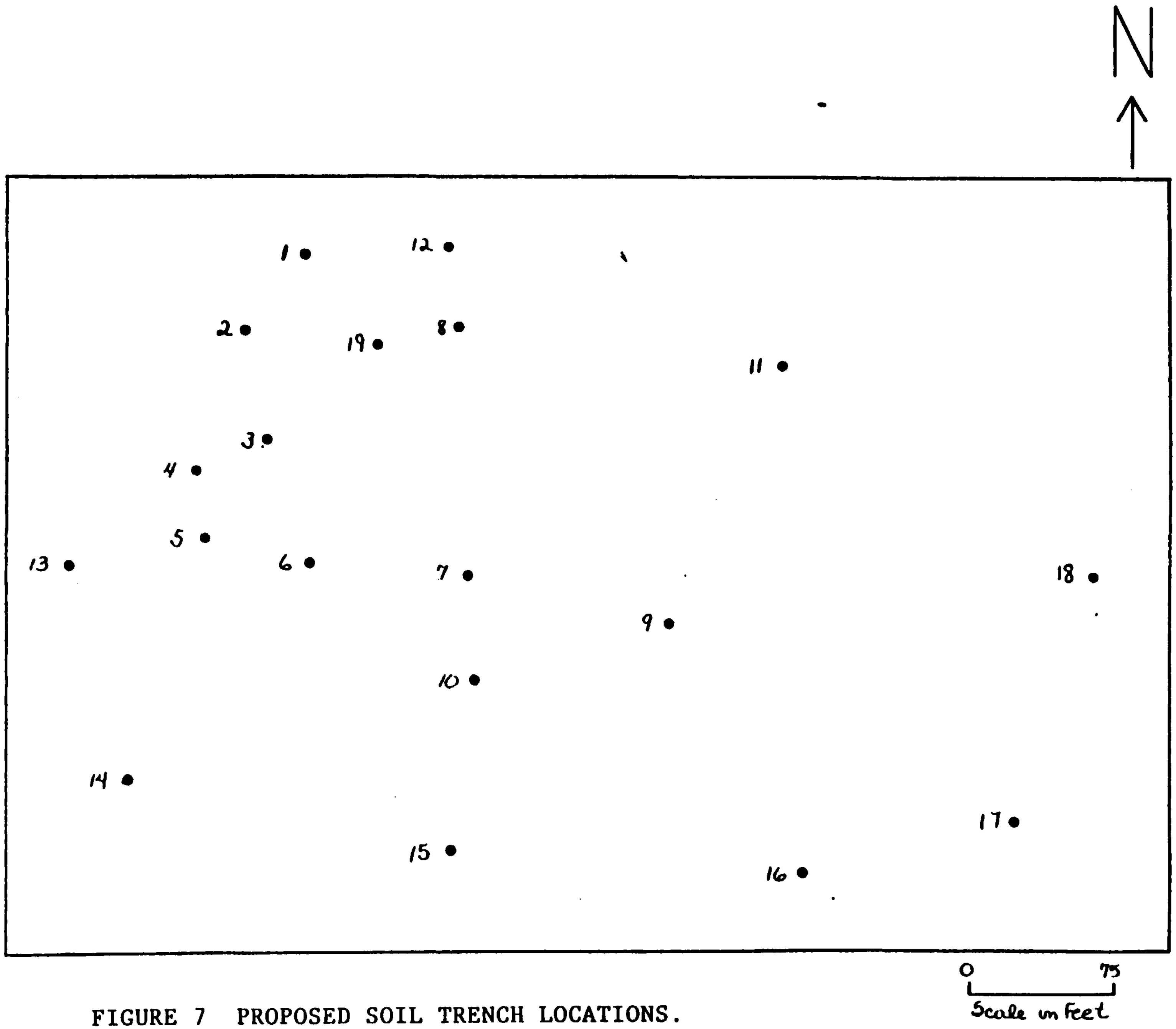

FIGURE 7 PROPOSED SOIL TRENCH LOCATIONS.

APPENDIX C

WWES STAFF BIOGRAPHIES

Robert W. Phillips
Director, ARCS Program Management Office
Project Manager

B.S. Natural Resources Planning and Conservation, 1969
Central Michigan University
B.S. Wildlife Management, 1970
University of Michigan
M.S. Resources Planning and Conservation, 1972
University of Michigan

As Director of the ARCS Program Management Office, Mr Phillips is responsible for directing a Corporate-wide, multi-million dollar, ten year, U. S. Environmental Protection Agency contract to perform remedial planning activities in Region V (OH, MI, IN, IL, WI, MN). This WW Engineering and Science contract consists of two functional parts, Program Management and Remedial Planning. Program Management is provided on a completion basis for the term of the contract and encompasses management, financial, administrative and clerical functions necessary to support and track contract project performance. Remedial Planning is provided on a Level of Effort (LOE) basis with all work being assigned through EPA issuance of work assignments. Mr. Phillips is responsible for directing the overall program through the ARCS Program Management Office (PMO). He has direct control and oversees all PMO personnel and technical staff performance, work task assignments, scheduling and budget preparation, cost control and tracking and communication between WW Engineering and Science, its operating companies and the U. S. EPA.

As a Project Manager for EDI, Mr. Phillips has responsibility for managing large multidisciplinary projects, providing other EDI service areas with technical expertise, and responding to client concerns on project quality control, budget, or schedule.

Mr. Phillips has been active on a variety of projects requiring environmental and human health impact and risk assessments. He has performed many field investigations and impact assessments involving on-site contamination at former coal gasification facilities. Mr. Phillips has also been responsible for undertaking environmental and human health risk assessments related to air emissions, surface and groundwater contamination, and terrestrial pollution incidents. In addition, he has prepared environmental impact assessments for an airport expansion, for the replacement of a historical bridge, and for the siting of industrial facilities. He has helped prepare and implement work plans for remedial investigations and feasibility studies for contaminated sites identified by state or federal priority lists. He has also managed various wetlands determination inventories and has prepared the associated wetland permit applications and mitigation plans for various industrial clients.

Prior to joining EDI, Mr. Phillips had over 12 years of professional experience in project development, management, and administration in the U.S., Canada, the Caribbean, and Middle East. He has worked on projects involving impact assessments for oil and natural gas development and transportation, critical features analysis for coal slurry pipelines, nationwide oil and hazardous materials emergency response, Superfund site remedial activities, industrial facility siting, surface water impact analysis and mitigation plan development, erosion control and reclamation programs, land use and recreational development, cultural resources inventories, endangered species surveys, environmental compliance monitoring activities for construction projects, and health and safety protocol development.

Mr. Phillips is a member of the following professional societies:

- Wildlife Society
- Michigan Association of Environmental Professionals

Richard R. Rediske, Ph.D.
Vice President
Director of Chemistry and Air Quality Services

B.S. Biology and Chemistry, 1974
Bowling Green State University

M.S. Water Resources Sciences, 1975
University of Michigan

Ph.D. Environmental Health Sciences/Chemistry, 1986
University of Michigan

As Director of Chemistry and Air Quality Services, Dr. Rediske is responsible for overseeing EDI's Analytical Laboratory and Air Quality Group. In addition, he serves as the corporate safety officer for hazardous waste projects and field activities.

With a strong background in hazard evaluation and monitoring, environmental chemistry, toxicology, and analytical techniques, Dr. Rediske has directed numerous analytical service projects for industry and government involving the measurement and identification of hazardous chemicals in the environment. His area of specialization is trace organic analysis by GC/MS, GC, and HPLC. In addition, he has participated in projects involving the fate of chemicals in water and soil and their risks to human health and aquatic organisms. Dr. Rediske has also prepared safety plans and monitored site safety activities for many of EDI's projects as well as developed in-house training programs.

Prior to joining EDI, Dr. Rediske was the Research Director for a large U.S. EPA study involving the fate of organic chemicals in the environment. He was also the organic chemistry director for a national group of laboratories.

Dr. Rediske has co-authored several articles published in scientific journals concerning the environmental fate of chemicals. He has also presented a number of technical seminars on environmental and analytical chemistry.

Dr. Rediske is a member of the following professional societies:

- American Chemical Society
- Water Pollution Control Federation
- World Safety Organization
- Sigma Xi

Dr. Rediske is also an Adjunct Professor of Chemistry at Grand Valley State University.

Dennis J. Gebben
Vice President
Director of Geological Services

B.S. Geology, 1969
Grand Valley State Colleges

M.S. Geology, 1979
Western Michigan University

Mr. Gebben is responsible for the overall management of geological services in EDI. He has organized and developed an accomplished staff of geologists with proven expertise in hydrogeology and other geological disciplines.

In addition to directing a staff of technical specialists, Mr. Gebben is experienced in work plan preparation, project budgeting, contract negotiations, and assuring the continued quality of project work. As a client manager, he is responsible for reviewing EDI's work and for maintaining good relationships with clients by soliciting feedback on the quality of EDI's work.

Mr. Gebben's professional experience as a geologist began in 1972, focusing primarily on hydrogeology. He has extensive experience in groundwater supply projects, site evaluations for land application of wastes from wastewater treatment facilities, groundwater remediation projects, and hazardous waste facility permitting. Major management responsibilities for Mr. Gebben began in 1981 with the expansion of EDI into a full-service environmental consulting firm. He has consequently organized and developed a professional staff for work related to hydrogeology, reflecting the growing importance of this science.

Mr. Gebben is a member of the following professional societies:

National Water Well Association

D. Eric Strang
Director of Project Management Group

B.S. Civil Engineering, 1975
Major in Environmental Engineering & Hydraulics
Michigan Technological University

Registered Professional Engineer - Michigan

As Director of EDI's Project Management Group, Mr. Strang is responsible for assigning new projects to project managers, assisting in development of project management skills, and developing and implementing annual group goals. He also acts as a Project Manager with EDI, and therefore is responsible for directing activities of a multidisciplinary project staff that supports EDI's comprehensive assignments. He assigns project staff members to various tasks and supervises and reviews their technical work. His responsibilities also include managing large multidisciplinary projects, such as hydrogeological investigations for ground water cleanup projects and other remedial action programs, project organization and budget management.

Mr. Strang has been involved in environmental engineering projects conducted for both the public and private sectors. These projects have included all aspects of the U.S. EPA "201" water pollution control facility planning process as well as detailed design of industrial and municipal wastewater collection and treatment systems. He has also demonstrated considerable experience and expertise in the planning and execution of multidisciplinary hazardous waste management and remedial action projects.

During a sabbatical leave, Mr. Strang worked overseas for a Japanese consulting firm as a project coordinator for large civil engineering projects undertaken for various U.S. military bases. Mr. Strang was also a project team member involved in the Final Clarifier Modification Project, winner of the 1980 Grand Conceptor Award for Engineering Excellence by the American Consulting Engineers Council.

Representative Project Experience:

Dowagiac, Michigan. Sundstrand Heat Transfer, Inc. Project Manager for a $2.5 million ground water cleanup with trichloroethylene and 1,1,1-trichloroethane being the principle contaminants involved. This remedial action involved:

- Excavation of ten underground solvents and oil storage tanks and construction of new above ground storage facilities.
- Excavation of 4,800 cubic yards of contaminated soils for landfilling in a licensed hazardous waste landfill.
- Extensive hydrogeological studies to determine the extent of the ground water plume of contamination and the necessary purge well system to capture and contain the plume of contamination.
- Design and construction of an 11-purge well system and underground transmission piping to transfer the water to a centralized treatment system.

- Design and construction of an AquaDetox air stripping treatment system to treat 1,300 gpm (1.87 mgd) of the contaminated ground water. The treatment system incorporates vapor carbon adsorbers for air emissions treatment. The air stripping tower achieves in excess of 99.9% treatment efficiency.

- An on-going ground water monitoring system to measure the effectiveness of the purge and treatment system.

Muskegon, Michigan. Brunswick Division. Project Manager for a ground water cleanup with toluene being the principal contaminant. This remedial action involved:

- Extensive hydrogeological studies to determine the extent of the ground water plume of contamination and the necessary purge well system to capture and contain the plume of contamination.

- Design and construction of a 200 gpm purge well and underground transmission piping to transfer the water to a dual-module carbon treatment system. This design also involved the use of an automatic well skimming system for recovering floating free product (toluene).

Pearl, Michigan. Organics/LaGrange. Project Engineer for a ground water cleanup with chloroform and methylene chloride contaminants. This remedial action involved:

- Hydrogeological studies to determine the extent of the plume of contamination, and the necessary purge well system to capture and contain the plume.

- Design and construction of five purge wells and underground transmission piping to transfer the water to a 170 gpm air stripping treatment system.

Sault Ste. Marie, Michigan. Project Manager for a Remedial Investigation/Feasibility Study (RI/FS) at a former tannery site. Major contaminants of concern were chromium, cyanide, lead, arsenic, cadmium, copper and zinc.

Mr. Strang is a member of the following professional societies:

Water Pollution Control Federation
American Society of Civil Engineers

Lucy B. Pugh
Manager, Engineering Services

B.S. Environmental Sciences Engineering, 1980
University of Michigan

M.S. Civil Engineering, 1981
University of Michigan

Registered Professional Engineer - Michigan

As Manager of Engineering Services, Ms. Pugh is responsible for scheduling and managing projects within the Engineering Group encompassing all phases of engineering from evaluations and studies to full-scale process design. She also serves as a project team member on multidisciplinary projects.

Ms. Pugh has been involved in a variety of projects for both industries and municipalities. She has conducted feasibility, treatability and full-scale studies and design of water and wastewater treatment processes, including physical/chemical treatment for the leather tanning and metal finishing industries and both aerobic and anaerobic biological treatment. Ms. Pugh has also been involved in projects dealing with waste minimization, and solid and hazardous waste management.

Ms. Pugh has published and presented a number of technical papers at the Purdue Industrial Waste Conference and the Annual Conferences of WPCF and AWWA. Her subjects have included treatability of and control of microbial contamination in metal working fluids, the use of ATP as a measure of biomass concentration and inhibition, anaerobic treatability of heat treatment liquor, full-scale demontration of biological phosphorus removal process, and the use of activated carbon for removal of volatile organics from water supplies.

Ms. Pugh is a member of the following professional societies:

Water Pollution Control Federation
American Society of Civil Engineers
Michigan Society of Professional Engineers
National Society of Professional Engineers

Craig A. VandenBerge
Project Geologist

B.S. Biology, 1979
Grand Valley State Colleges

B.S. Geology, 1984
Grand Valley State Colleges

As a Project Geologist assigned to EDI Engineering & Science's Geology Group, Mr. VandenBerge's responsibilities have included proposal preparation, budget estimating, field sampling, supervision of monitoring well construction, interpretation of hydrogeological data, and preparation of hydrogeological reports. He has also been involved in the analytical modeling and design of groundwater purging and treatment systems.

Mr. VandenBerge has coordinated the various elements of a hydrogeological investigation, including aquifer permeability and characterization tests and analysis, delineation of the horizontal and vertical extent of groundwater contamination, and monitoring well sampling and analysis procedures. Other field investigation experiences have included borehole geophysical logging and interpretation, surface resistivity, and seismic evaluation, determination of soil characteristics, and in situ soil vapor survey. Mr. VandenBerge has also undertaken as part of his project responsibilities the identification of contamination source areas, the preparation of recommendations for remedial action, and the implementation of groundwater treatment strategies. Mr. VandenBerge's project work has been conducted for a variety of industrial clients.

William T. Davidson
Geologist

B.S. Geology, 1981
Hope College

M.S. Geology, 1986
Baylor University

As a geologist, Mr. Davidson's responsibilities include the evaluation of hydrogeologic data, the design and implementation of monitoring well construction, and the preparation of hydrogeological reports. He has been involved in the exploration and evaluation of municipal ground water supplies. Mr. Davidson has also set up ground water monitoring programs and prepared hydrogeological reports to meet the requirements of RCRA Part B permits and hazardous waste programs.

Mr. Davidson has coordinated a variety of field programs associated with applied hydrogeological investigations including: soil boring and monitoring well construction; geophysical techniques such as borehole, gamma ray, resistivity, and EM logging; surface resistivity; in-situ aquifer permeability analysis; and aquifer pumping test design and interpretation.

Prior to joining EDI, Mr. Davidson was a logging engineer in Western Oklahoma and was assigned to monitor and evaluate various aspects of oil well drilling operations. This position included computer-based pressure evaluation profiles, hydrocarbon detection, and lithologic interpretation.

Mr. Davidson is affiliated with the following professional societies:

National Water Well Association

Jeffrey C. Sutherland
Assistant Director of Geology

A.B. Geology, 1962
Cornell University

Ph.D. Geology, 1968
Syracuse University

Registered Professional Engineer - Michigan
Certified Professional Geologist, AIPG
Diplomate, American Academy of Environmental Engineers

As Assistant Director of Geology, Dr. Sutherland's responsibilities include coordination and assignment of work for the geology staff, technical review of geological reports, and development of the technical capabilities of the service area. He also serves as quality assurance coordinator for the Geology group where he develops specific QA/QC procedures and guidelines. He assists other area managers with their QA/QC activities.

Dr. Sutherland has managed numerous hydrogeological and interdisciplinary projects for groundwater development, groundwater cleanup, treatment of municipal wastewater through land application (upland, overland flow, wetlands), and hazardous waste site investigation. He has conducted research and published numerous articles on the technical and economic factors related to land application of municipal wastewater.

He is a member of the following professional societies:

- American Institute of Professional Geologists
- Association of Ground Water Scientists and Engineers
- National Society of Professional Engineers
- American Academy of Environmental Engineers
- American Association for the Advancement of Science

Christopher A. Miron
Design Engineer

B.S. Chemical Engineering, 1988
Michigan Technological University

Engineer in Training

As a design engineer with EDI, Mr. Miron is responsible for completing remediation studies and associated designs under the direction of a project engineer or project manager. He has been involved in the design of a number of treatment systems for the removal of various toxic substances from water. Mr. Miron's responsibilities include feasibility studies, preliminary design, mechanical layout, purchasing, writing work plans and specifications and SARA Title III reporting.

Mr. Miron has experience with a number of industries, including chemical manufacturing, research and distributors, metal finishing, and a variety of other manufacturers. Mr. Miron also has been active in the design, purchase, and construction of air stripping and carbon adsorption systems for the treatment of contaminated ground water. Other projects with which Mr. Miron has been involved include the study of air stripping as a means of treating potable water, tank removal and closure projects, and soil remediations, either through the use of soil vapor extraction or selected sampling and excavation.

Mr. Miron is a member of the American Institute of Chemical Engineers.

Julie A. Beaton
Project Manager

B.S. Geology, 1977
Grand Valley State College

As a Project Manager with EDI, Ms. Beaton is responsible for managing large multidisciplinary projects, including engineering for the design and construction of facilities used to implement remedial action programs and hydrogeological investigations for ground water and soil cleanup.

Ms. Beaton has been involved on a variety of projects for both industrial and governmental clients. These projects have included cleanup activities at industrial plant sites and train derailments. Ms. Beaton served as the Project Geologist for the 1982 ACEC award-winning cleanup of a chemical spill that occurred as a result of a train derailment. In addition, she has directed the installation of purge well systems for recovering contaminated ground water and directed the implementation of air stripping systems, aqueous and vapor carbon adsorption systems, and a vacuum-assisted steam stripping system for treating contaminated ground water. To help clients meet new UST system requirements, she also manages projects to upgrade underground storage facilities.

Prior to joining EDI in 1981, Ms. Beaton worked for Williams & Works where she performed duties as a field technician, geologist, project geologist, and study manager on a variety of public and private projects.

Ms. Beaton is a member of the following professional societies:

Association of Groundwater Scientists and Engineers
(a division of the National Water Well Association)
Association for Women Geoscientists

Glenn A. Hendrix
Senior Environmental Scientist/Limnologist

B.S. Zoology and Limnology, 1977 (with honor)
Michigan State University

M.S. Biological Sciences (Aquatic Ecology), 1983 (with honor)
Michigan Technological University

Mr. Hendrix conducts environmental studies for industry, government, and business, including environmental assessments, environmental fate and effects of toxic substances, limnological investigations, wetland studies and water quality studies. He assists clients with permitting requirements and compliance with environmental regulations.

Mr. Hendrix has completed a variety of environmental projects. These projects include: evaluation of the impacts of contaminated groundwater on human health and the environment; permit requirements for hazardous waste facilities; Remedial Investigations/Feasibility Studies for Superfund sites; limnological investigations; water quality studies; wetland identification, permitting, and mitigation; and environmental assessments for a chemical plant, a power plant, a large manufacturing plant, bridge construction, airport expansions, and hazardous waste facilities.

Prior to joining EDI, Mr. Hendrix worked on a large rural non-point source pollution study sponsored by the U.S. EPA and developed a system for identifying critical areas that were non-point sources of pollutants in Michigan. He has also conducted limnological and biological surveys of Lake Michigan, Lake Superior, inland lakes, and streams. He also coordinated a U.S. EPA-sponsored study of toxic contaminants in a large river system, including sampling, data analysis, modeling, and technical review.

Mr. Hendrix has written a number of articles and reports on the fate of toxic chemicals in aquatic environments, water quality, non-point source pollution, small quantities of hazardous wastes, and environmental assessment. He has completed training by the Environmental Protection Agency on wetland delineation and jurisdiction.

Mr. Hendrix is a member of the following professional societies:

International Association for Great Lakes Research
American Society of Limnology and Oceanography
North American Lake Management Society
American Water Resources Association
Association of Wetland Managers

Steven J. Hoin
Project Geophysicist

B.S. Geology, 1979
Wayne State University

M.S. Geology/Geophysics, 1981
Western Michigan University

As a project geophysicist at EDI, Mr. Hoin is responsible for managing, designing, and interpreting geophysical surveys. He is also skilled at integrating the geophysical data with associated geological and hydrogeological data.

Mr. Hoin has been involved in a variety of investigations. Some of these projects have included electromagnetic resistivity, seismic refraction, ground penetrating radar, magnetometer, or borehole geophysical surveys. These surveys have been used to define the extent of brine contamination, to locate buried tanks and to map geologic structures such as buried river valleys. He is familiar with many field instruments. He has also had experience with monitoring well design and installation, well testing and sampling, and a variety of related technical tasks. He has written many hydrogeological and geophysical reports. He also has experience with technical computer programming.

Prior to joining EDI, Mr. Hoin was employed for three and a half years with Amoco Production Company as an exploration geophysicist. While at Amoco, Mr. Hoin was involved in projects involving seismic data processing and interpretation, computer modeling, and refraction statics programming.

Mr. Hoin's master's thesis is a ground magnetic study of the Albion-Scipio Oil Field Trend.

Mr. Hoin is a member of the following professional societies:

- National Water Well Association
- Society of Exploration Geophysicists